CHAPTER 2
ALTERNATIVES
INCLUDING THE PROPOSED ACTION

2.0 ALTERNATIVES INCLUDING THE PROPOSED ACTION

2.1 Introduction

This chapter discusses alternatives available to the USACE and to Alcoa, including the No Action Alternative and development of the proposed Three Oaks Mine (the Proposed Action). This chapter also describes a variety of alternatives that have been considered by the USACE and Alcoa, but which have been rejected as infeasible for one or more reasons including environmental, technological, and economic considerations (see Section 2.4); these alternatives are not analyzed in detail in this EIS. **Table 2-1** summarizes the alternatives considered in this document and their primary attributes. These alternatives, including the rationale for their consideration in this EIS, are discussed in detail in the following sections of this chapter.

2.2 Alternatives Available to the USACE

The USACE has determined that the Proposed Action requires authorization under an individual permit pursuant to Section 404 of the CWA (see Chapter 1.0). There are three alternatives relative to the Proposed Action available to the USACE: 1) issue the permit, 2) issue the permit with special conditions, or 3) deny the permit. Permit denial is referred to as the No Action Alternative (see Section 2.3).

2.3 No Action Alternative

Under the No Action Alternative, the USACE would deny Alcoa's application for an individual Section 404 permit. As a result, the proposed Three Oaks Mine would not be developed, and the potential impacts to the natural or human environment identified for the Proposed Action would not occur. However, there would be impacts associated with the No Action Alternative, as described in Chapter 3.0, and the cumulative impacts associated with interrelated actions (described in Section 2.6) would likely continue.

Implementation of the No Action Alternative would not meet the purpose and need for the project. However, the No Action Alternative must be addressed, because a permit cannot be issued by the USACE if such issuance would be contrary to the public interest and would not comply with the Section 404(b)(1) guidelines. Also, it's inclusion in this analysis is required under provisions of NEPA and serves as a basis for comparison of environmental impacts among alternatives. Under this alternative, the identified lignite reserves at the proposed Three Oaks Mine would not be mined and used as fuel at the existing Alcoa and TXU power generating facilities at Rockdale.

The No Action Alternative does not mean, however, that there would be no impacts to the lands in and near the Three Oaks Mine. The potential exists that Alcoa and CPS would retain the property and utilize or lease the lignite reserve at a later date, or that some portion of the land would be sold for purposes of development. The USACE has chosen not to speculate on the nature of the future land use, and has not predicted these possible future impacts from the No Action Alternative. Also note that with No Action, there still would be regional impacts, as identified in the analyses of cumulative impacts, that are caused by

Table 2-1
Summary of Alternatives Considered and Their Primary Attributes

Alternative	Advantages	Disadvantages	Reason for Eliminating from Consideration, if Applicable
Alternatives Considered in Detail			
No Action	• Eliminates Three Oaks Mine-related environmental impacts. • Eliminates emissions and discharges from Alcoa's aluminum smelter.	• Triggers adverse socioeconomic impacts through resultant smelter closure.	• Fails to meet Alcoa's purpose and need for continued smelter operations – retained as mandated under NEPA regulations.
Three Oaks Mine (Proposed Action)	• Maintains smelter operations and associated socioeconomic benefits.	• Triggers various adverse environmental impacts as discussed in detail in Chapter 3.0.	• Retained for analysis as the Proposed Action as it meets the purpose and need of the project.
Alternatives Considered but Eliminated from Detailed Analysis			
Purchased Power for Smelter	• Eliminates Three Oaks Mine-related environmental impacts. • Eliminates emissions from Alcoa's three generating units.	• Associated economic costs and supply uncertainties would force smelter closure.	• Fails to meet Alcoa's purpose and need for continued smelter operations.
Western Coal for All Units	• Eliminates Three Oaks Mine-related environmental impacts. • Reduces emissions from Alcoa's three generating units.	• Anticipated conversion and transportation costs would force smelter closure.	• Fails to meet Alcoa's purpose and need for continued smelter operations.
Natural Gas for All Units	• Eliminates Three Oaks Mine-related environmental impacts. • Reduces emissions from Alcoa's three generating units.	• Conversion costs, fuel supply costs, and fuel cost instability would force smelter closure.	• Fails to meet Alcoa's purpose and need for continued smelter operations.
Deeper Mining at Sandow	• Eliminates or defers the need to develop a new lignite reserve.	• Geologic conditions are not conducive to deeper mining. • Groundwater pumpage and discharge would increase substantially.	• Operational costs and safety issues render this impractical.
Milam Reserve	• Would keep additional impacts closer to currently affected towns and communities.	• Would require greater environmental disturbance than at the Three Oaks Mine. • Not a consolidated reserve.	• Acquisition difficulties render this impractical.
Camp Swift Reserve	• None identified.	• Would involve greater transportation costs and impacts in comparison to Three Oaks Mine due to greater distance.	• Reserve is not legally available for Alcoa's acquisition and use.

Table 2-1 (Continued)

Alternative	Advantages	Disadvantages	Reason for Eliminating from Consideration, if Applicable
Underground Mining	• Reduced visual impacts and surface disturbance.	• Geologic conditions are not conducive to underground mining. • Lower lignite recovery from underground operations.	• Operational costs and safety issues render this impractical.
Dip-oriented Pits	• None identified.	• Would increase operational difficulties. • Would create difficulties in rerouting Farm-to-Market (FM) 696.	• No advantages identified.
Truck/Shovel Mining	• Improved flexibility for selective handling of poor soil and overburden materials. • Reduced noise and visual impacts.	• Large new capital investment required. • Higher operating costs.	• Identified advantages would not offset the economic disadvantages.
Water Reuse and Disposal	• Reduces or eliminates Three Oaks Mine-related impacts from water discharge.	• Water discharge effects are both beneficial and adverse. • Economic costs and additional surface disturbance associated with water pipeline.	• Identified advantages would not offset the economic disadvantages.
Aquifer Reinjection	• Eliminates Three Oaks Mine-related impacts from water discharge. • Reduces aquifer drawdown effect.	• Water discharge effects are both beneficial and adverse. • Economic costs and additional surface disturbance associated with water pipeline.	• Identified advantages would not offset the economic disadvantages.
Fuel Blending	• Reduces the Three Oaks Mine-related impacts. • Reduces emissions from Alcoa's three generating units.	• Conversion and transportation costs would be similar to the total conversion to western coal – would force smelter closure.	• Fails to meet Alcoa's purpose and need for continued smelter operations.

activities other than the Three Oaks Mine; for example, aquifer drawdown associated with regional pumping by entities other than Alcoa.

The No Action Alternative likely would force Alcoa to terminate existing operations at its aluminum smelter (Hodges 2001). The No Action Alternative, however, would not necessarily result in closure of the electrical generating units at the Rockdale facility since these units could be converted to use western coal, and the higher costs could be passed on to customers on the electrical grid. These options are discussed further in the following sections.

For purposes of this analysis, the USACE assumes that the No Action Alternative would result in closure of Alcoa's aluminum smelter. It is further assumed that the four electrical generating units would be converted to use western coal.

2.4 Alternatives Available to Alcoa

Alcoa considered various alternatives during feasibility studies for the Three Oaks Mine. In addition, the USACE identified potential alternatives to the Three Oaks Mine based on issues identified during the scoping process and project evaluation. The alternatives considered included alternatives to constructing and operating the Three Oaks Mine that involved alternate energy sources for the power plant and smelter (see Section 2.4.1); alternate plans for constructing, operating, and reclaiming the Three Oaks Mine itself (see Section 2.4.2); and using a combination of Three Oaks Mine lignite and another source of fuel (e.g., western coal) as a blended fuel source (see Section 2.4.3). All of these alternatives were considered relative to their technological and economic feasibility as well as their apparent likelihood to reduce environmental impacts. The USACE has reviewed the data and analyses provided by Alcoa and has conducted an independent review of the associated costs. Based on the available data, the USACE believes Alcoa's analysis to be reasonable. Based on the USACE's evaluation, these alternatives have been considered but subsequently eliminated from detailed analysis in this EIS. This section describes the rationale for their elimination.

2.4.1 Alternatives not Requiring Construction of the Three Oaks Mine

Alcoa has evaluated the use of three energy supply alternatives to the mining and use of local lignite:

- Purchase of electricity from the commercial grid;
- Use of lignite or coal from the western U.S. to fuel the existing power plants; and
- Use of natural gas to fuel the existing power plants after the existing boilers were appropriately modified.

These alternatives, Alcoa's rationale for not selecting them, and the USACE's review of this rationale are discussed in this section. Other alternatives involve mining lignite from local reserves other than the Three Oaks area. As discussed below, all of these alternatives have been considered but eliminated from detailed analysis in this EIS.

As indicated in the description of the purpose of and need for the Proposed Action (Section 1.2), Alcoa's principal considerations were:

- Aluminum is traded as a commodity on the world market, and its price reflects global conditions. To remain in operation, Alcoa's Rockdale smelter must produce aluminum at a cost that is competitive in the world market.

- Because smelting requires large amounts of electricity, the cost of electricity is important to the viability of aluminum production. Energy comprises approximately one-third of the total cost of primary aluminum production (Evans 1995). The Rockdale operation is typical of aluminum smelters, in that it was originally sited to be near the fuel source for low-cost electricity.

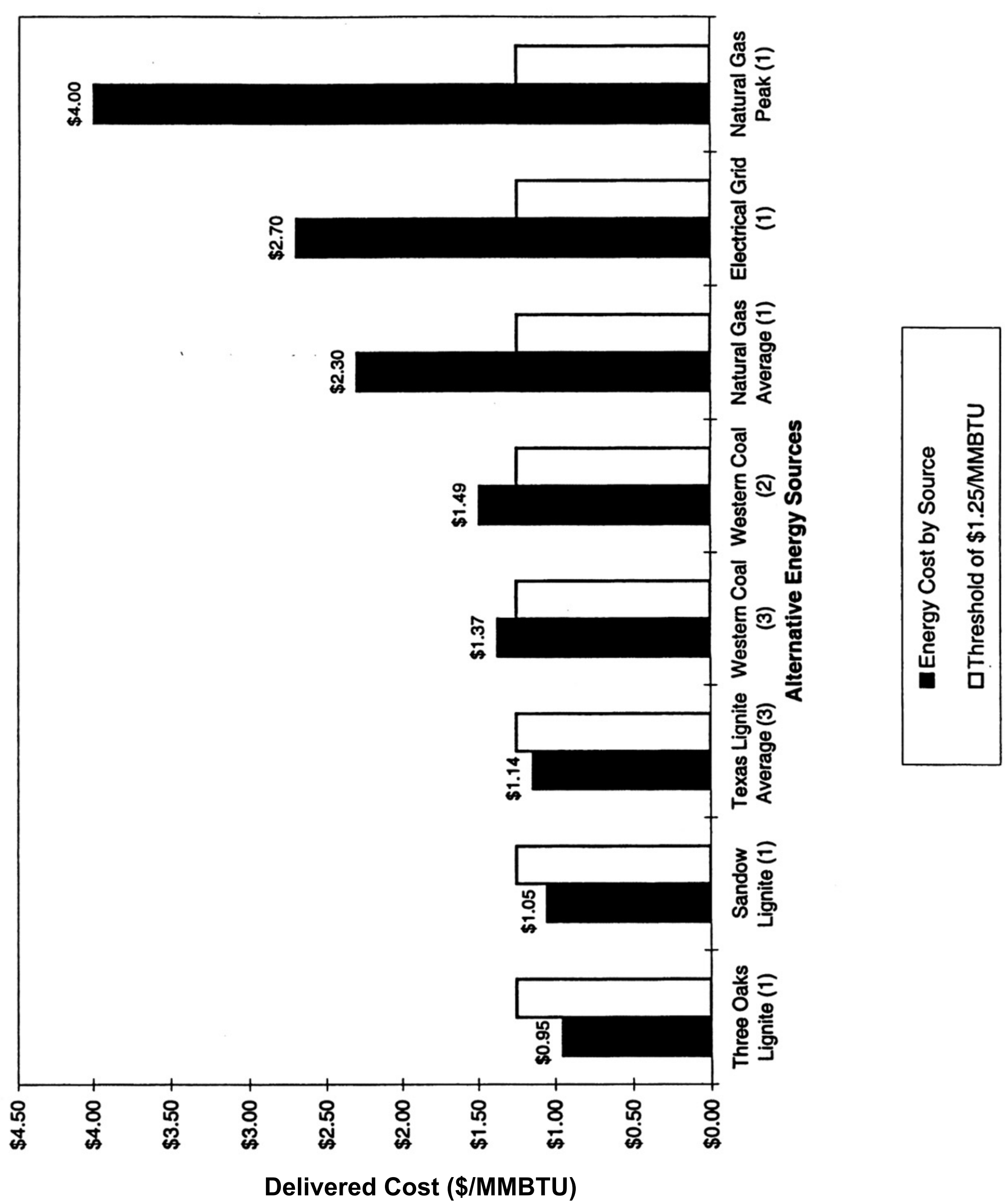
- Local lignite is the only fuel source that is controlled by Alcoa. This means that in addition to costs being low initially, they can be held stable for decades. For other energy sources, recent trends indicate variability and probable increases in cost over a relatively short time.

The economics of the Alcoa aluminum operation are quite different than those of energy companies like TXU, which produce electricity for the commercial grid. Commercial producers generally sell energy at a much higher price than would be viable for aluminum smelting, and they typically have rate structures that allow the cost increases of source fuels to be passed on to customers.

The economic evaluation summarized in **Figure 2-1** shows the relative costs of alternative energy sources and the approximate cost threshold at which Alcoa has stated the Rockdale smelter would cease to be competitive in the world market. Alcoa has identified this threshold as $1.25 per million British thermal units (MMBTU). With existing Sandow Mine lignite, the Rockdale operation only would be marginally competitive, as the $1.05 MMBTU cost would rise quickly as mining at greater depth was required. According to Alcoa, the key factors allowing continued operations at Rockdale have been the stable costs of the Sandow Mine, Alcoa's control of three of the existing power generating units, and the long-term contract with TXU for electricity (see Section 1.2). In support of its conclusions, Alcoa also cites the fact that numerous smelting facilities worldwide have closed in recent years, with 17 percent of Alcoa's global capacity now being idle; energy costs are a major factor in this trend.

As shown in **Figure 2-1**, lignite from the Three Oaks Mine would be less costly to produce than Sandow Mine lignite, which should make the Rockdale operation more competitive in the world market. Alcoa's evaluations indicate that the use of other fuels would price Rockdale aluminum out of the market, causing the smelter to close.

In November 1999, a petition was filed with the RRC asking that certain lands in the area of the Three Oaks Mine be declared unsuitable for surface coal mining. As part of the process of evaluating the petition, the RRC staff evaluated the economic impacts of an unsuitability determination (Walter and Blair 2000). The RRC staff findings are summarized in **Table 2-2** and indicate the relative costs of Three Oaks Mine lignite versus western coal and natural gas for Alcoa's Rockdale operation. RRC staff concluded "These data all



Sources: (1) Alcoa 2001; (2) USACE review of published data; (3) Walter and Blair 2000.

Three Oaks Mine

Figure 2-1

Relative Costs of Alternative Energy Sources

Table 2-2
Nominal Worth of Three Oaks Lignite, Based on RRC Analysis

Area	Area (acres)	Approximate Thickness[1] (feet)	Volume (acre-feet)	Tons
Life-of-mine mine block	5,809.95	25.8	149,896.71	262,319,243
			Tonnage	262,319,243
			Heat content[2] (MMBTU)	3,454,744,424
			Delivered cost[3]	$3,938,408,643
			Comparison values	
			Western coal[4]	$4,732,999,861
			Natural gas[5]	$10,208,769,772

[1]Average net lignite thickness from core data for the proposed Three Oaks permit area (from application, Docket No. C1-0004-SC-00-A). Seams 1.5 feet thick were considered mineable. Mining depth was not considered because only the area within the proposed life-of-mine mine block was evaluated.
[2]Determined using average heat content of Bastrop-Lee County lignite of 13.17 MMBTU/ton (6,585 BTU/lb).
[3]Estimated value of lignite within proposed Three Oaks life-of-mine area, based on average in-state delivered cost from mine to power plant of $1.14/MMBTU (year 2000 dollars).
[4]Approximate value of equivalent energy source, based on average delivered cost of Powder River Basin coal to Texas of $1.37/MMBTU (year 2000 dollars). Cost ratio of equivalent western coal to Texas lignite = 1.2.
[5]Approximate value of equivalent energy source, based on average in-state delivered cost of $2.95/MMBTU (year 2000 dollars). Cost ratio of equivalent natural gas to Texas lignite = 2.6.

Notes: All unit price data were obtained from the U.S. Department of Energy, Energy Information, Administration: http://www.eia.doe.gov; current as of November 10, 2000.
Alcoa's current mine plan includes a slightly smaller mine block area than addressed in this table.

Source: Walter and Blair 2000.

serve to show that, where satisfactory lignite thickness and volumes exist, Texas lignite remains, in terms of equivalent unit energy needs, the most cost-effective option over western coal and natural gas within the State." The RRC report also reviewed Alcoa's assertion that mining the lignite in the Three Oaks area "is the only option that is viable for maintaining the full economic strength of the local community and the company within the central Texas region" (Hodges 2000), and noted that, "Staff's evaluation of available economic information tends to support this claim, without consideration of capital costs related to fuel conversion of the power plant" (Walter and Blair 2000).

Additional information on alternative energy sources is presented in the following sections.

2.4.1.1 Purchased Power for Smelters

For the foreseeable future, there are adequate supplies of commercial electricity available in central Texas, and transmission capacity exists to deliver power to the Rockdale smelter. Thus, Alcoa could purchase the energy it needs for the smelter from the commercial grid and TXU's Unit 4. Presumably if this were done, Alcoa's three power generating units at Rockdale would shut down, but the TXU plant would continue operation, thus still requiring a continued supply of lignite or conversion to another fuel. The TXU generating unit is projected to consume approximately two-thirds of the proposed production from the proposed Three Oaks Mine.

Power for the local electrical grid is generated by burning lignite, western coal, oil, natural gas, or by using nuclear fuel. Prices and availability of electricity are subject to market conditions. Current prices would make this source non-economic as an electricity source for the Rockdale aluminum smelter (see **Figure 2-1**). Long-term availability and cost of power are not predictable and thus cannot be assumed to make electrical grid power any more competitive than at present.

In addition to the price of electricity from the local grid, Alcoa would face a number of additional conversion costs associated with this scenario that have not been considered and estimated in detail. These would include installation of additional transformers, capacitors, and other equipment to achieve compatibility with and facilitate use of the 138-kilovolt (kV) grid power as opposed to the 13.8-kV power currently provided by the Alcoa generating units (Hodges 2002).

Nationwide, some aluminum smelters operate using local electrical grids. These grids, in turn, are operated by semi-governmental agencies, such as the Tennessee Valley Authority (TVA) and Bonneville Power Administration (BPA) within the U.S. Department of Energy. These agencies use hydropower from federally funded dams to generate inexpensive electricity. In addition, the TVA has the ability to negotiate long-term contracts with individual customers. However, in the case of the BPA, contracts have been renegotiated so that marginal power can be sold to higher bidders, such as California, leaving aluminum smelters to reduce production or close plants and lay off workers. As a result, the use of commercial electricity has been eliminated from further analysis based on the high cost of grid power and the potential for supply interruption.

2.4.1.2 Western Coal for All Units

Alcoa could modify its existing power generating units, and TXU could modify its existing power generating unit, to use western coal. Western coal used in Texas is typically mined in the Powder River Basin of Wyoming; it is transported by either the Burlington Northern Santa Fe (BNSF) or Union Pacific Southern Pacific (UPSP) railroads to electric power generating plants located throughout the state. Those plants served by both railroads typically are able to negotiate lower rail tariffs due to competition. Alcoa's Rockdale smelter and power plant is only served by the UPSP, which could limit Alcoa's ability to negotiate favorable rail contracts. In addition, rail offloading and storage facilities would need to be installed at the power plant. In 1997, Alcoa commissioned an engineering feasibility study for use of Powder River Basin coal in Alcoa's three generating units. This study estimated that the cost of infrastructure and facilities needed to unload, store, and process western coal would be over $13 million. In addition to the delivery, storage, and handling facilities, this approach would require crushing, pulverizing, and handling equipment modifications estimated to cost $15 to $17 million (Hodges 2002).

Western coal contains less ash and sulfur, and has a higher heat output than the lignite located within the proposed Three Oaks Mine. Only approximately 5 million tons per year of western coal would be needed to supply the existing plants, and there would be 30 to 40 percent less ash disposal required. Even with these savings, the cost of western coal per equivalent heat output would be higher than Three Oaks Mine lignite, due largely to transportation costs. Using coal prices averaged over the past 5 years, estimates have been made for this EIS. The USACE estimates that Powder River Basin coal delivered to Rockdale would cost approximately $1.49 per MMBTU (without drying). As a comparison, Alcoa's estimated cost for producing and delivering lignite from the Three Oaks Mine is approximately $0.95 per MMBTU (Hodges 2001). Thus, the Powder River Basin coal alternative would represent a direct fuel cost increase of approximately 57 percent. The USACE has reviewed fuel cost estimates in relation to documented fuel costs at other sites in central and eastern Texas. The cost estimate for western coal used by the RRC (Walter and Blair 2000) is similar to and slightly below that derived by the USACE (see **Figure 2-1**). Other economic factors related to the use of this resource include:

- Capital cost of approximately $15 million to convert the TXU generating unit to western coal (Alcoa estimate);
- Capital cost of approximately $40 million to convert the three Alcoa generating units to burn western coal (Alcoa estimate);
- Transportation contracts are normally limited to 5 years and are adjustable based on variations in the price of diesel fuel;
- Loss of approximately 30 percent of output capacity for Alcoa's generating units operating on western coal that is not dried (Alcoa estimate);
- Most new contracts contain provisions that adjust the price to market every 5 years;
- Increase of approximately 30 percent in overall power production cost to operate a coal drying system, as currently used for lignite, to preserve the generating capacity of 120 MW per unit; and
- Existing costs for western coal would make smelting non-competitive, and future costs, especially those for transportation, are likely to increase.

As a result of the above factors, Alcoa has determined that this alternative would not meet the purpose and need of the project.

As discussed in Section 1.1.2.2, Alcoa plans a number of modifications to their three generating units as part of the VERP process. Additional modifications also may be implemented as a result of recent USEPA and TNRCC enforcement actions related to the facility. However, it is not expected that these modifications would significantly alter the basic economic comparison between western coal and local lignite as the western coal price, transportation costs, and infrastructure costs for unloading and handling facilities would remain unchanged.

2.4.1.3 Natural Gas for All Units

If a pipeline were built capable of providing 85 million cubic feet per day (MMCFD) of natural gas to the Rockdale power generating units, and if economics otherwise justified the expenditure of $100 million in capital costs, the existing generating units could be converted to natural gas. There would be savings because of the minimal need for emissions controls and for ash disposal. However, additional factors considered by Alcoa included the following:

- Deregulation of wellhead natural gas prices and restructuring of interstate pipeline transportation have led to the establishment of a highly competitive and complex natural gas market that experiences marked short-term price fluctuations;

- The overall price of natural gas can be expected to increase in the future based on current trends; and

- Natural gas prices are expected to be higher and more unpredictable than lignite or western coal prices.

As a result, the overall cost of electricity from the existing power plants, even without the capital costs of conversion, would more than double due to the cost of the natural gas (as shown in **Figure 2-1** and **Table 2-2**), and continued smelter operation would not be considered viable by Alcoa (Hodges 2001).

2.4.1.4 Alternative Lignite Sources

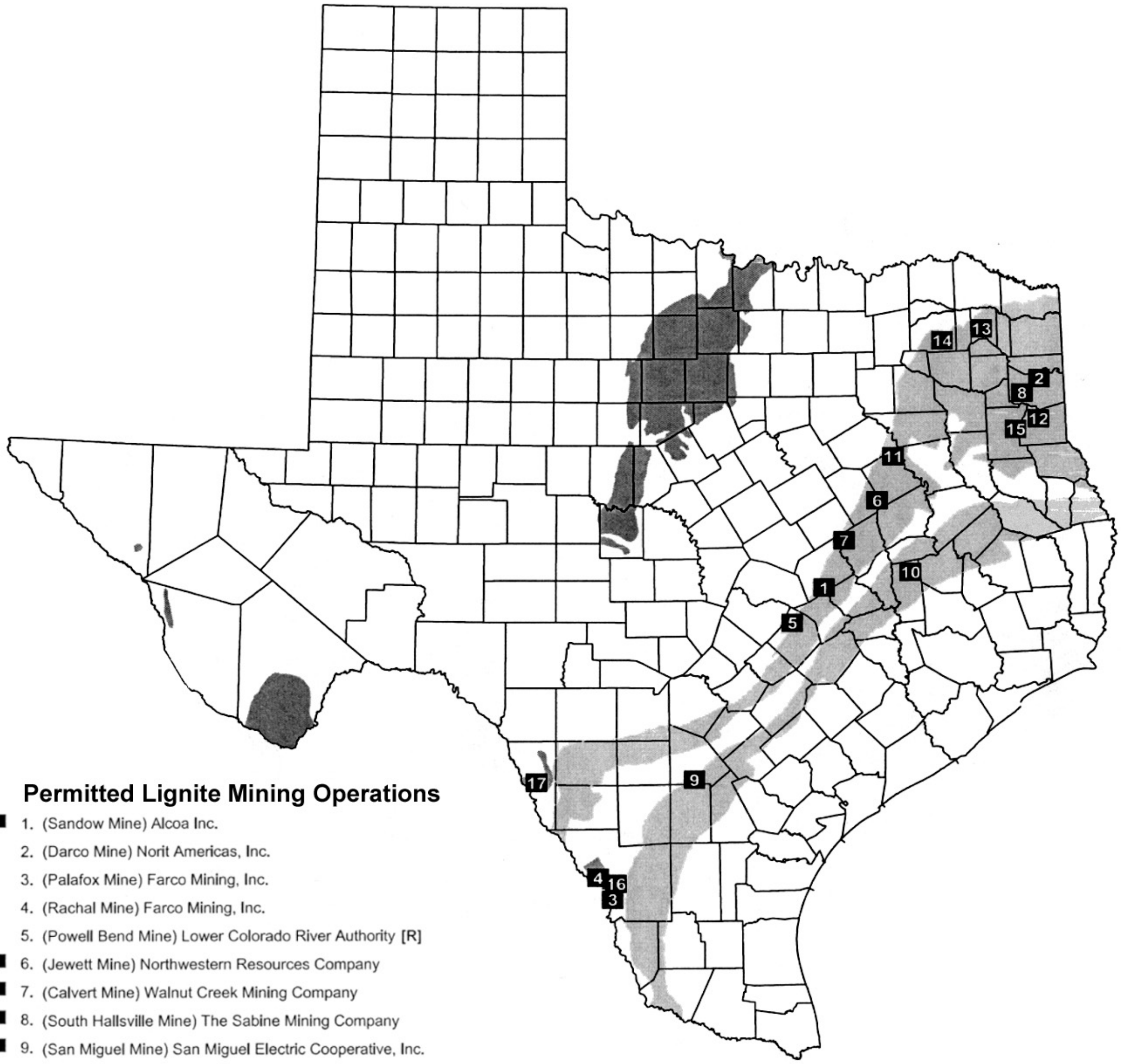
There are extensive lignite reserves in Texas, and many lignite mines are operational (**Figure 2-2**). Thus, it would be possible for Alcoa to obtain Texas lignite from a location other than the Three Oaks Mine site. However, lignite has a relatively low heat content and as a result, a larger quantity is required to generate power, compared to western coal. Consequently, transportation costs would be relatively high; therefore, as a practical matter, lignite development is limited to mines that are very close to the customer. For the Rockdale power generating units, there are three potential mine sites (in addition to Three Oaks) that have been considered: 1) deeper mining at the existing Sandow Mine; 2) following the Sandow Mine lignite seams to the northeast in Milam County, rather than to the southwest to the Three Oaks Mine area; and 3) the Camp Swift area lignite reserve.

Deeper Mining at the Sandow Mine

Alcoa has been mining at Sandow for nearly 50 years. Nearly all of the lignite with less than 200 feet of overburden already has been mined. These lignite seams continue past the 200-foot depth line dipping toward the southeast. Theoretically, more lignite reserves could be acquired, and Alcoa could continue to mine at greater depths and supply fuel to the power plant for 30 more years.

Alcoa considers this not to be a viable option based on safety and economic considerations. Thousands of acres of new reserves would have to be acquired. Up to 400 feet of overburden would have to be moved. In excess of $100 million of capital would have to be invested in earth-moving equipment capable of achieving such deep mining (probably bucket-wheel excavators). Safety and slope stability would be a major concern in the unconsolidated overburden. All these factors would substantially increase operating costs, which would likely make Rockdale smelter operations non-competitive in the global market.

An additional consideration is that mining at greater depths would require substantially increased pumping from the Simsboro aquifer to adequately depressurize the aquifer. It is anticipated that the increased pumping and the increase in surface disturbance would result in additional environmental impacts. However, these impacts have not been evaluated in detail as Alcoa has determined, and the USACE agrees, that the increased water use, required capital expenditures, increase in operating costs, safety concerns, and uncertainties associated with mining at these depths make this an uneconomic alternative.



Permitted Lignite Mining Operations

1. (Sandow Mine) Alcoa Inc.
2. (Darco Mine) Norit Americas, Inc.
3. (Palafox Mine) Farco Mining, Inc.
4. (Rachal Mine) Farco Mining, Inc.
5. (Powell Bend Mine) Lower Colorado River Authority [R]
6. (Jewett Mine) Northwestern Resources Company
7. (Calvert Mine) Walnut Creek Mining Company
8. (South Hallsville Mine) The Sabine Mining Company
9. (San Miguel Mine) San Miguel Electric Cooperative, Inc.
10. (Gibbons Creek Mine) Texas Municipal Power Agency [R]
11. (Big Brown Mine) TXU Mining Company
12. (Martin Lake Mine) TXU Mining Company
13. (Monticello Mine) TXU Mining Company
14. (Thermo Mine) TXU Mining Company
15. (Oak Hill Mine) TXU Mining Company
16. (Treviño Mine) Farco Mining, Inc.
17. (Eagle Pass Mine) Dos Repúblicas Resources Co., Inc.

Legend

Areas of Geologic Conditions Relating to Occurrence of Coal
Areas of Geologic Conditions Relating to Occurrence of Lignite
17 Permitted Coal Mine (not all active)
Power Plant

N

Source: Adapted from Railroad Commission of Texas Surface Mining & Reclamation Division.

Three Oaks Mine

Figure 2-2

Lignite Mines of Texas

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Milam Mine

Another lignite alternative considered by Alcoa was a reserve in Milam County. This lignite reserve to the northeast of the Sandow Mine is commonly referred to as the Milam reserve, which is located between U.S. Highways 77 and 79.

This reserve was evaluated with respect to several criteria, including the following:

- Mining costs
- Lignite quality
- Overburden depth
- Overburden-to-lignite ratio
- Environmental impacts
- Dewatering requirements
- Depressurization requirements
- Reclamation feasibility
- Property control

Alcoa found the Three Oaks lignite reserve to have a number of important advantages over the Milam reserve. In particular, the Three Oaks reserve has a much lower overburden-to-lignite ratio than the Milam reserve, resulting in less disturbance area per ton of lignite mined. The Milam reserve would require greater amounts of groundwater withdrawal for depressurization and dewatering of the Simsboro aquifer than would be required at the proposed Three Oaks Mine, resulting in a potential increase in groundwater drawdown and other interrelated environmental impacts.

According to Alcoa, property sales and control issues in recent years have effectively eliminated the Milam reserve as a feasible option to supply lignite over the long term. The original large contiguous land tracts have been divided into smaller tracts for development. Shell Mining Company, which originally controlled the Milam reserve, began acquiring lignite property in the mid-1970s and continued through the early 1990s. Shell transferred its rights to the reserve to another mining company in the mid-1990s, which subsequently sold them to another company. Alcoa negotiated with all of these companies, but no agreements were reached. The Milam reserve properties were sold to many different individuals at approximately the same time that Alcoa entered into the lease agreement with CPS (1998). Alcoa began permitting activities immediately for the Three Oaks Mine with the goal to be mining in the 2003 to 2004 timeframe. The timing of the Milam reserve properties sale eliminated it as a viable alternative. The property acquisition for this type of project typically takes 10 to 15 years as indicated by CPS's time to acquire the Three Oaks reserve and by Shell's time to acquire the Milam reserve. Waiting an additional 10 years before permitting activities could begin was not feasible due to the small amount of reserves remaining at Sandow (Hodges 2002).

Camp Swift

The potential environmental effects of developing the lignite reserves at the Camp Swift Military Reservation in Bastrop County were considered and analyzed in an EIS prepared by the Bureau of Land Management (BLM) in 1980 (BLM 1980a,b). The BLM prepared the EIS in conjunction with the proposed competitive leasing of lignite reserves at Camp Swift. The proposed leasing action was in response to a hardship coal lease application submitted to the BLM by the Lower Colorado River Authority (LCRA) of Austin, Texas.

As noted in the Camp Swift EIS and stipulated in 43 CFR 3400.3-2, the lease of this mineral reserve is available by law only to public entities. Thus, it is not considered to be a viable Alcoa fuel source alternative in this EIS.

2.4.2 Alternatives for Construction and Operation of the Proposed Mine

2.4.2.1 Mine Layout and Sequencing Alternatives

Alcoa evaluated different mine pit orientations. Strike-oriented pits (pits excavated parallel to the geologic strike of the lignite seam) would run in a southwest to northeast direction (roughly parallel to the direction of FM 696). Dip-oriented pits (pits excavated perpendicular to the geologic strike of the lignite seam) would run perpendicular to strike pits. Strike pits have the advantage of consistent, shallow overburden in the early years of mining and the disadvantage of consistently deep overburden in the later years. Generally, dip pits allow a much more consistent overburden removal requirement over the life of the mine. Several geologic faults exist in the Three Oaks reserve. These faults generally run parallel with the strike pit direction, and thus favor the strike-oriented pits. Dip pits would require having to frequently ramp the draglines up and down steep slopes. The public road reroute requirements for these two alternatives also are quite different. Dip pits would require that FM 696 be rerouted to the southeast of the mine and intersect U.S. Highway 290 approximately 2 or 3 miles east of its existing intersection. Strike-oriented pits allowed for the reroute of FM 696 northwest of the mine, leaving its intersection with U.S. Highway 290 intact. The northwest reroute would be much less disruptive to the traveling public. Alcoa has selected to use strike pits due to the problems associated with the faults and to minimize impacts to FM 696.

In addition, minor layout changes were made in response to county road department requirements. While included in this EIS, transportation changes and associated impacts also are addressed separately in an environmental assessment by the Texas Department of Transportation in TxDOT (2001).

2.4.2.2 Mine Operations Alternatives

Alcoa considered both surface mining and underground mining methods; however, underground mining is not feasible in this setting. The unconsolidated overburden does not have the strength necessary for underground mining to be conducted safely.

Alcoa considered alternatives involving three methods of overburden removal: 1) utilizing Alcoa's two existing draglines from the Sandow Mine, 2) using one of Alcoa's draglines in combination with a large truck/shovel fleet, and 3) utilizing a large truck/shovel fleet with no draglines. Draglines generally are the most capital-intensive alternative, but they remove overburden at a lower cost than trucks/shovels over a long period of time. Trucks/shovel fleets are much more flexible than draglines due to their mobility. All of these alternatives allowed for appropriate reclamation of the land after mining. Ultimately, the use of two draglines was selected, as Alcoa had already invested the capital for these machines. Alcoa estimated the initial capital expenditure required to implement a truck/shovel operation to be between $40 and $45 million (Hodges 2002).

2.4.2.3 Lignite Transport Alternatives

Alcoa has evaluated two alternatives regarding lignite transportation: 1) trucks and 2) conveyors. Trucking requires less up-front capital expenditures, but the labor, maintenance, and fuel costs are higher. Conveyors are expensive to construct but are cheaper to operate in the long term. Alcoa is still evaluating the conveyor option due to the long-term financial implications. Both options are analyzed in Chapter 3.0 relative to potential environmental impacts and additional mitigation requirements.

2.4.2.4 Ancillary Facility Alternatives

Water Reuse and Disposal

Water from dewatering or depressurization not used for mining purposes, such as dust suppression and vehicle washing, would be discharged directly to area streams, and/or piped to a public water supply system.

The conceptual alternative exists for Three Oaks Mine water to be used for power plant cooling and other processes associated with manufacturing activities. With this alternative, pumping for these purposes from the Sandow Mine would be replaced with a pipeline from the Three Oaks Mine. A new pipeline to replace the existing pipeline from the Sandow Mine to the Rockdale facilities would be much longer and more costly than using the existing facilities and would result in additional pumping costs. Alcoa has estimated the cost of pipeline and pumping facilities needed for this alternative to be approximately $18.5 million (Hodges 2002). Additionally, Alcoa would have to acquire the water rights for the pumped water from SAWS. Costs of the water rights are not included in this cost estimate. For these reasons, this conceptual alternative has not been considered further by Alcoa.

Aquifer Reinjection/Reinfiltration at Simsboro Outcrop

Another conceptual alternative for discharge of excess water pumped for dewatering and depressurization at the Three Oaks Mine would be to pipe the excess water to the Sandow Mine area and allow it to reinfiltrate or be injected into the Simsboro. Theoretically, this disposal approach would tend to accelerate the recovery of the aquifer drawdown resulting from the Sandow Mine. While this alternative does not address potential impacts projected from the Three Oaks Mine, it likely would alleviate cumulative pumpage impacts in the vicinity of the Sandow Mine. Negative considerations include: 1) the cost of acquiring, if possible, the necessary water rights from SAWS; 2) the cost of constructing and operating a pipeline for several miles from the Three Oaks Mine area to the Simsboro outcrop, probably near the north end of the Sandow Mine; 3) the fact that most of the Simsboro outcrop area near the Sandow mine is private property not controlled by Alcoa, necessitating expensive land acquisition for infiltration basins; and 4) potential slight reduction in the depressurization efficiency at the proposed mine caused by accelerated recovery of the Simsboro drawdown. Alcoa has estimated the cost of pipeline, pumping facilities, and infiltration basins for this alternative to be approximately $75 million, without including the cost of acquiring the water rights (Hodges 2002).

2.4.3 Fuel Blending Alternative

This alternative would involve a combination of a reduced scale operation at the Three Oaks Mine with use of western coal to achieve a higher MMBTU fuel blend. The blended fuel would be expected to produce less ash, less local air pollution, and higher energy levels per ton of fuel consumed than the burning of lignite alone. Additional facilities would be required at the generating plants to handle the addition of western coal and produce the desired blend characteristics. Alcoa has examined this alternative and considers it to be economically infeasible for the following reasons:

- Like the conversion to use western coal alone, this alternative would require the installation of rail offloading and storage facilities estimated to cost approximately $30 million;

- The reduced output from the Three Oaks Mine would result in higher per-unit cost of lignite produced at the facility due to reduced economies of scale; and

- The western coal involved is higher priced than the expected production costs of the Three Oaks lignite (approximately $1.49/MMBTU versus $0.95/MMBTU).

In summary, fuel blending appears to offer no economic advantage to a total conversion of the generating units to burn western coal alone; that alternative has been discussed earlier in Section 2.4.1.2 and also is considered economically infeasible for most of the same reasons. In addition, a fuel blending alternative would result in land disturbance at both the Three Oaks Mine and at the location of the source of western coal. The extent of this disturbance is unknown.

2.5 Description of Alcoa's Preferred Alternative (Proposed Action)

The proposed project would be located on a 16,062-acre site in Lee and Bastrop Counties, approximately 6 miles southwest of Alcoa's existing Sandow Mine (**Figure 1-3**). The proposed mining operation is designed to replace the Sandow Mine (see Section 1.1.2.1), which would close once the Three Oaks Mine reached full production. Start-up of the Three Oaks Mine would be phased with reduced production from the Sandow Mine so that production of lignite would remain relatively constant during the transition period from 2003 to 2004.

Personnel and equipment not needed for final reclamation and closure activities at the Sandow Mine would be transferred to the Three Oaks Mine. Proposed Three Oaks Mine equipment is shown in **Table 2-3**. The number of personnel to be employed at the operation by phase of activity is shown in **Table 2-4**. Alcoa plans to operate the Three Oaks Mine 24 hours per day, 365 days per year. The estimated annual payroll for the Three Oaks Mine, including benefits, would be approximately $17 million. In addition, taxation income to Bastrop and Lee Counties would be generated from real and personal property taxation and sales taxes related to the mine.

As shown in **Figure 2-3**, the proposed Three Oaks Mine would utilize a portion of the existing infrastructure at the Sandow Mine. This infrastructure would include the haul road and conveyor corridor within the Sandow Mine permit area and temporary use of mine facilities until those facilities are replaced with new

Table 2-3
Three Oaks Mine Equipment

Equipment Item	Number	Average Annual Operating Hours/Unit
102- to 115-cubic-yard draglines	2	7,000
9.5- to 19.5-cubic-yard backhoes	4	5,000
12-cubic-yard front-end loader	1	3,500
120- to 160-ton bottom dump trucks	9	4,500
90-ton long-haul trucks[1]	20	4,000
50- to 100-ton end-dump trucks	6	4,000
Utility front-end loader	1	1,000
Utility backhoes	2	3,000
Crawler tractors	14	4,500
Rubber-tired dozers	2	1,000
Motor graders	4	4,000
Scrapers	3	2,000
Water trucks	5	4,500
Miscellaneous service vehicles	25	1,000
Light trucks and vans	60	1,000

[1]Long-haul trucks would be used in the absence of an overland conveyor.

Source: Alcoa 2001c (Volume 3).

Table 2-4
Three Oaks Mine Employment

Time Frame	Alcoa Employees	Contractors	Total
Construction period	0	150	150
Operations period	210	50	260
Closure and final reclamation period	100	0	100

Source: Hodges 2001.

facilities that would be constructed at the Three Oaks Mine. Prior to initiation of mining at the Three Oaks Mine, the existing haul road and conveyor corridor at the Sandow Mine would be extended to the southwest end of the Sandow permit area as part of the Sandow operations. This transportation corridor would facilitate transfer of Sandow Mine draglines to the proposed mine and the transport of lignite from the proposed mine to the existing power generating site. The disturbed areas associated with the proposed Three Oaks Mine by major category are shown in **Table 2-5**.

Several lignite seams within the Calvert Bluff Formation would be recovered beginning at the outcrop and progressing in successive pits downdip to the extent of mining equipment capabilities (approximately 250 feet in depth). Current designs propose mining of one to seven different lignite seams. Lignite seams considered recoverable range in thickness from approximately 1 foot to 12 feet. The amount of lignite

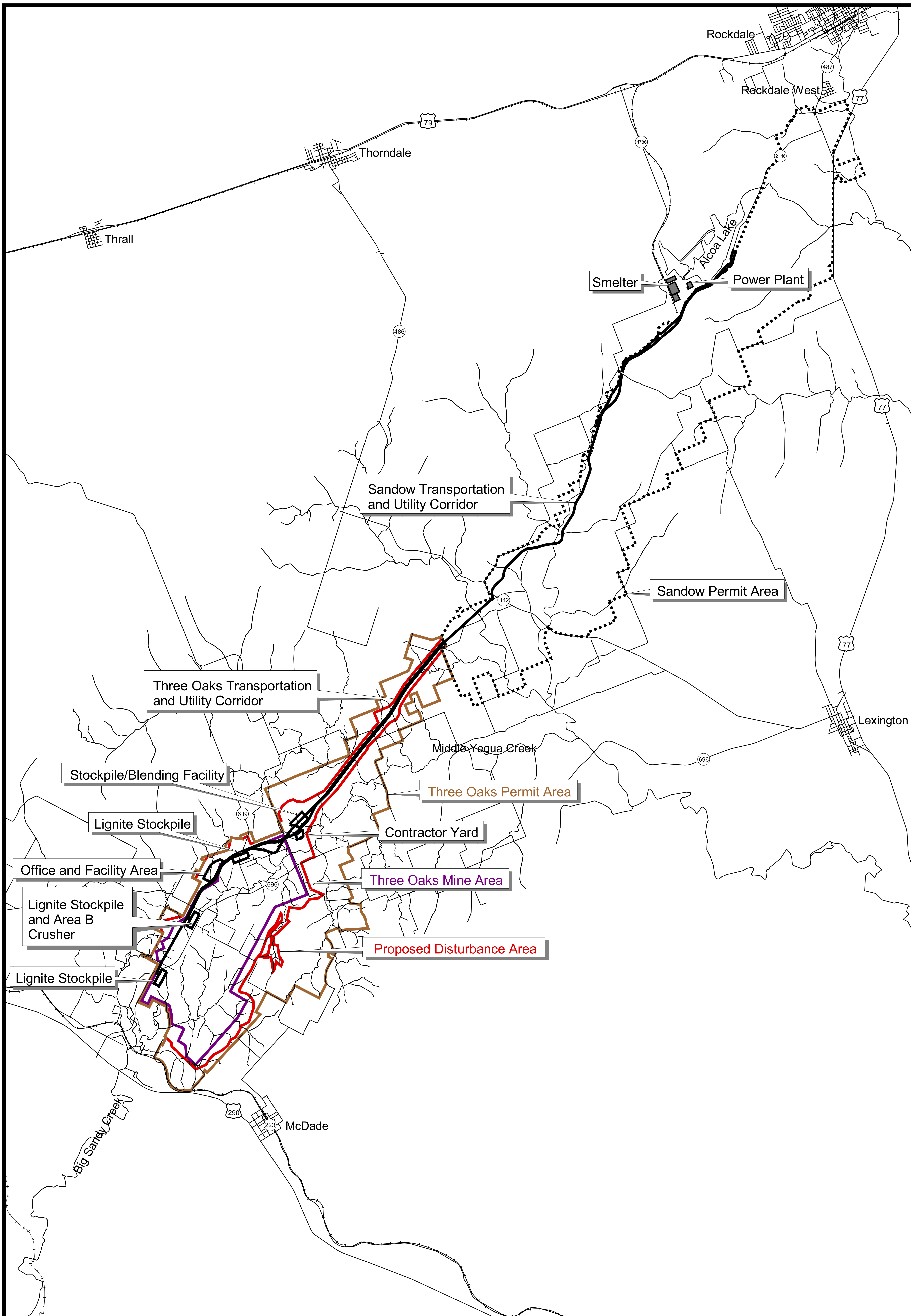

Figure 2-3
Proposed
Three Oaks
Mine Components

Three Oaks Mine

Notes:
Drainages and roads external to the study area have been simplified for presentation.

Source: Adapted from Alcoa 2001c.

N

0 1 2 Miles

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Table 2-5
Estimated Incremental Surface Disturbance Areas (acres)

Year	Transportation/ Utility Corridor	Three Oaks Mine Support Facilities	Three Oaks Mine Pits[1]	Relocated Roads and Utilities	Total
Three Oaks Mine Permit Area					
Year 1	359	1,145	575	137	2,216
Year 2	0	0	314	0	314
Year 3	0	0	248	0	248
Year 4	0	0	242	62	304
Year 5	0	0	314	0	314
Years 6-10	0	215	1,414	0	1,629
Years 11-15	0	0	1,163	0	1,163
Years 16-20	0	0	1,065	0	1,065
Years 21-25	0	264	1,131	0	1,395
Outside of Permit Area					
Year 1	0	0	0	6	6
Totals	**359**	**1,624**	**6,466**	**205**	**8,654**

[1]For purposes of this analysis, it has been assumed that Contingency Area 1 would be mined in year 5, Contingency Area 2 in years 6 through 10, and Contingency Area 3 in years 6 through 15. Actual dates for mining these areas would depend on the actual rate of pit advancement in the first 5 years.

Source: Hodges 2002.

extracted would depend on the technology that Alcoa uses to achieve emissions reductions at its existing power units. Historically, the Sandow Mine has produced an average of 6.2 million tons of lignite per year, and a similar production rate would be expected at the Three Oaks Mine if scrubber technology were used for emission controls. However, if fluidized bed boiler technology were chosen, the modified units would be more tolerant of lower-grade high-ash lignite. In this case, it is likely that production would be on the order of 7.0 million tons per year; the overall generating capacity also would increase, which would provide more power for sale to the grid. As discussed in Section 1.1.2.2, the increase in lignite production would not substantially change the disturbance area, and it would result in a small reduction in the amount of overburden that is used in reclamation.

Two 102- to 155-cubic-yard capacity draglines would be used to remove overburden and interburden (the material to be removed above and between the lignite seams, respectively) to allow access to the lignite seams. This method would involve both highwall and spoil side positions for the equipment, as currently utilized at Alcoa's Sandow Mine. No blasting is proposed. The volume of overburden and interburden production would vary with the depth to which mining would occur. Projected material production by year for the first 5 years and subsequent 5-year periods for the life of the mine is shown in **Table 2-6**, and the projected individual mining panels are illustrated in **Figure 2-4**.

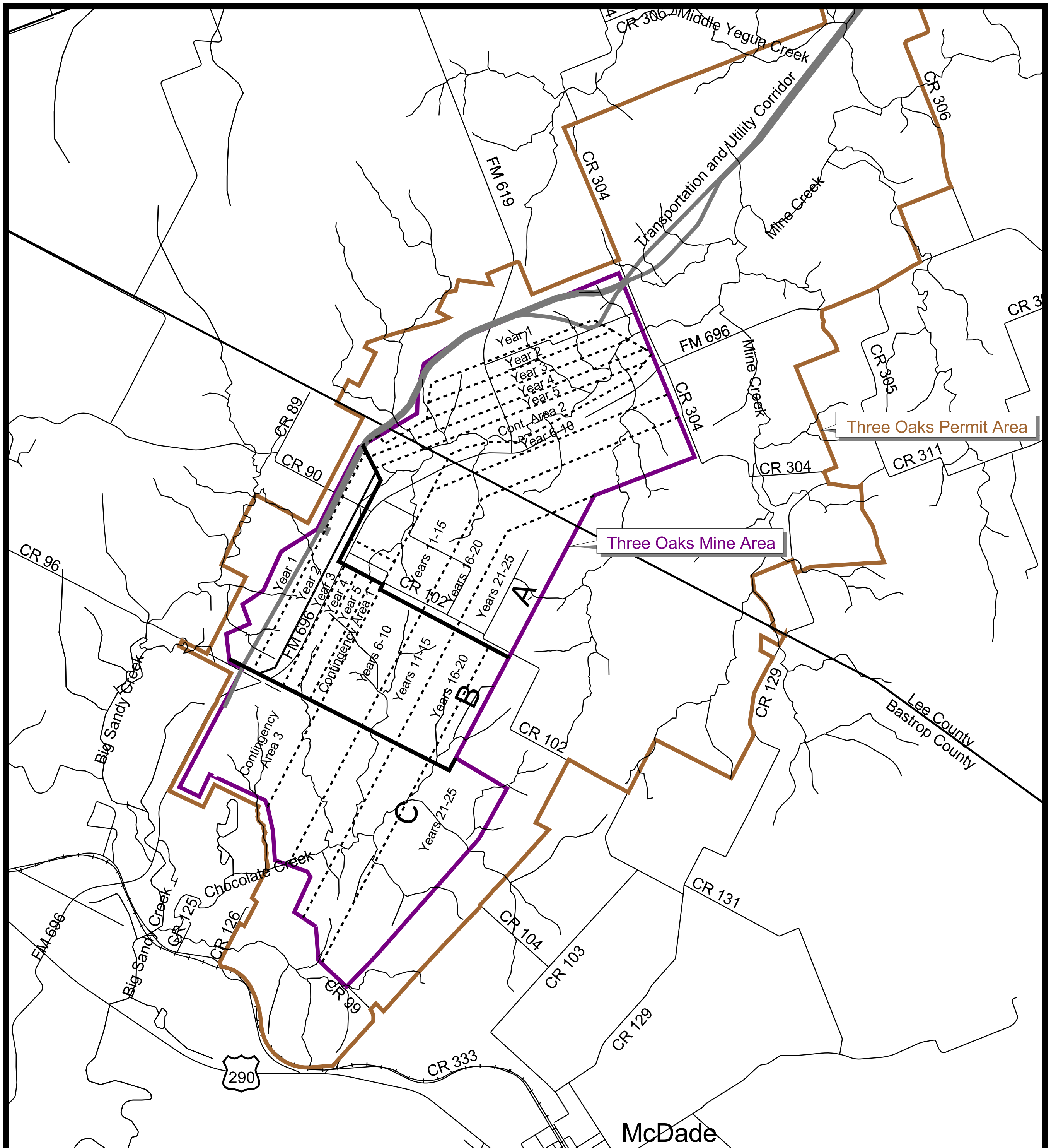
Table 2-6
Production Schedule

Year/Period	Overburden/Interburden (million cubic yards)	Lignite (million tons)[1]
1	35.1	7
2	33.3	7
3	32.6	7
4	30.1	7
5	29.8	7
6-10	140.7	35
11-15	167.3	35
16-20	175.2	35
21-25	194.6	35
Total	**838.7**	**175**

[1]Production schedule assumes use of fluidized bed boiler technology at Alcoa's generating units.

Source: Hodges 2002c.

The mine plan illustrated in **Figure 2-4** includes three panels labeled Contingency Areas 1, 2, and 3. Contingency Areas 1 and 2 are included in the initial 5-year permit term. Exploration drilling has shown some of the lignite seams to be of marginal quality. Plans are to blend these higher ash seams with lower ash seams. If this blending operation proves to be unsuccessful, these higher ash seams would be disposed of as spoil and mining would have to cover a larger area to recover the tonnage required for the power plant. In other words, Alcoa may mine the areas labeled years 1 through 5 plus some of the Contingency Areas during the initial permit term. Similarly, the specific schedule for mining Contingency Area 3 would depend on actual coal seam quality encountered in later years during the second and third 5-year permit terms. For purposes of this environmental impact analysis, it is assumed that Contingency



Source: Adapted from Alcoa 2001c.

Three Oaks Mine

Figure 2-4

Mine Block Sequence

7/15/02

Area 1 would be mined in year 5, Contingency Area 2 would be mined evenly during years 6 through 10, and Contingency Area 3 would be mined evenly during years 6 through 15.

Once an initial box pit is excavated, overburden and interburden from each subsequent pit would be backfilled into the previous pit to establish a graded surface at approximately the same elevation as the pre-mining surface. This surface would be suitable for completion of reclamation procedures currently in use at the Sandow Mine. These procedures would include rough grading, final grading, replacement of soils from prime farmland areas, testing of selectively handled overburden and interburden for suitability, seeding and planting, and other final reclamation tasks. The sequence of activities would be implemented to achieve land use and long-term reclamation goals as approved by permitting agencies prior to site construction.

The proposed permit area is located near the communities of Elgin, Butler, McDade, Beukiss, and Adina. None of these communities are located within the area proposed to be mined or within the area to be used for support facilities or infrastructure. However, several non-mine-related roads (county roads [CRs] and state roads) and utilities cross the proposed disturbance areas and would need to be relocated to facilitate mining. These roads and utilities are shown in **Figures 2-5, 2-6,** and **2-7** and identified in **Tables 2-7** and **2-8**.

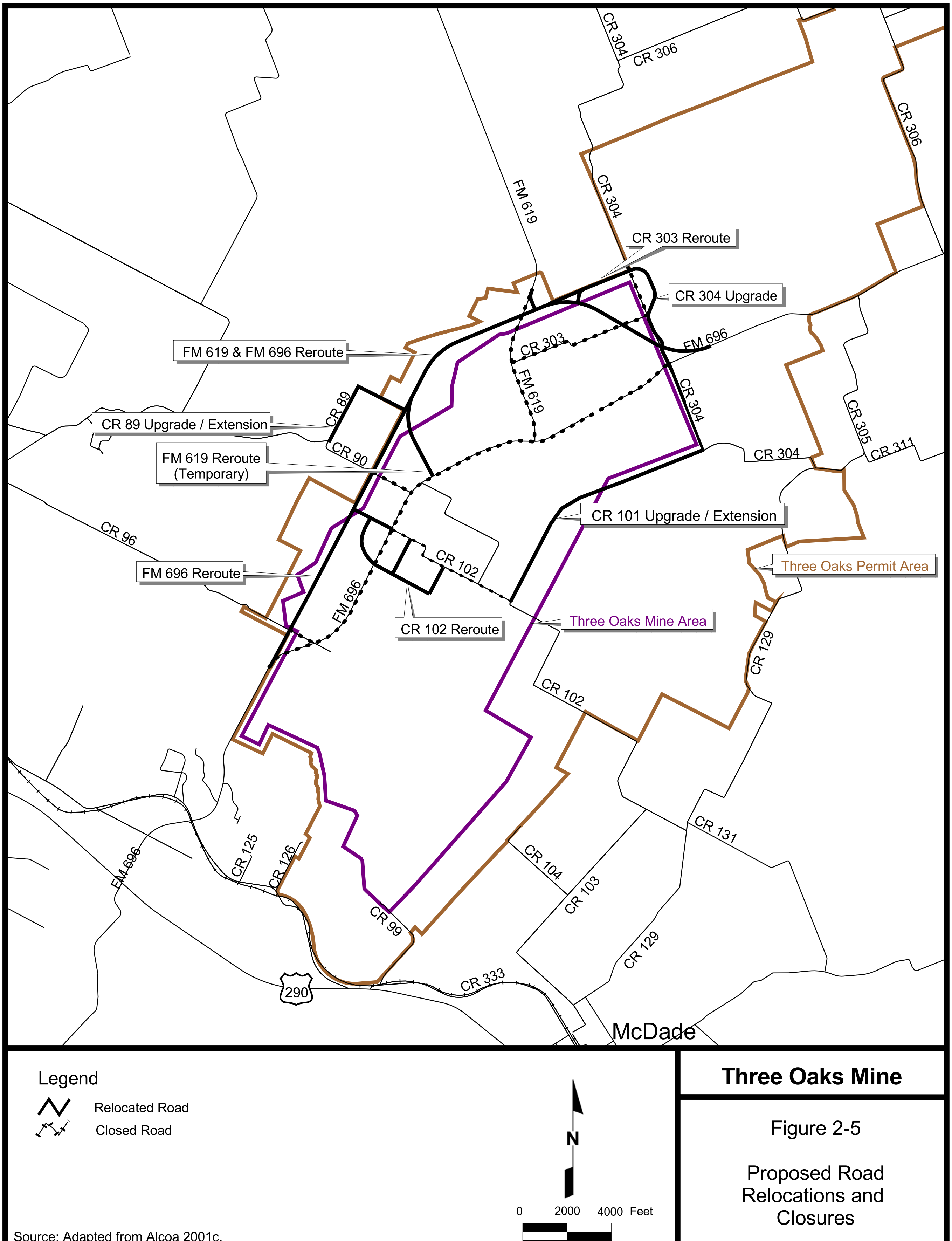
During final stages of mine development and subsequent reclamation, additional reroutes would be required for some of these utilities. Final routes for some utilities may cross the mined area in close proximity to the original pre-mine pathway. Final routes for some utilities have not yet been designed or negotiated with affected landowners and utility companies. **Figure 2-8** shows the configuration of a proposed haul road crossing of a county road.

Both the land surface and the lignite resource located within the proposed mining area are or would be controlled by Alcoa prior to mining. Control would be established and maintained through lease from the current owners or through Alcoa ownership. Most lignite within the proposed mining area is owned by San Antonio CPS and was acquired with the intent of mining the lignite for power generation. Alcoa has leased these tracts from CPS. The areas proposed for location of the support facilities and infrastructure also would be controlled by Alcoa prior to initiation of construction of these facilities; control would be through direct ownership or lease.

The proposed project area is shown in **Figure 2-3**. The area of new surface disturbance associated with the Proposed Action during individual years or groups of years is shown in **Table 2-5**. As a result of sequential backfilling of the mine pits and concurrent reclamation, the acreage of lignite mining disturbance at any given time during the mine operations would be approximately 640 acres.

For purposes of this discussion, the activities associated with the proposed Three Oaks Mine are addressed in three general phases:

- Construction or development activities (primarily in mine year 1);
- Operations or steady-state mining activities (mine years 1 to 25); and
- Closure and final reclamation activities (primarily in mine years 25 to 30).



Three Oaks Mine

Figure 2-5

Proposed Road Relocations and Closures

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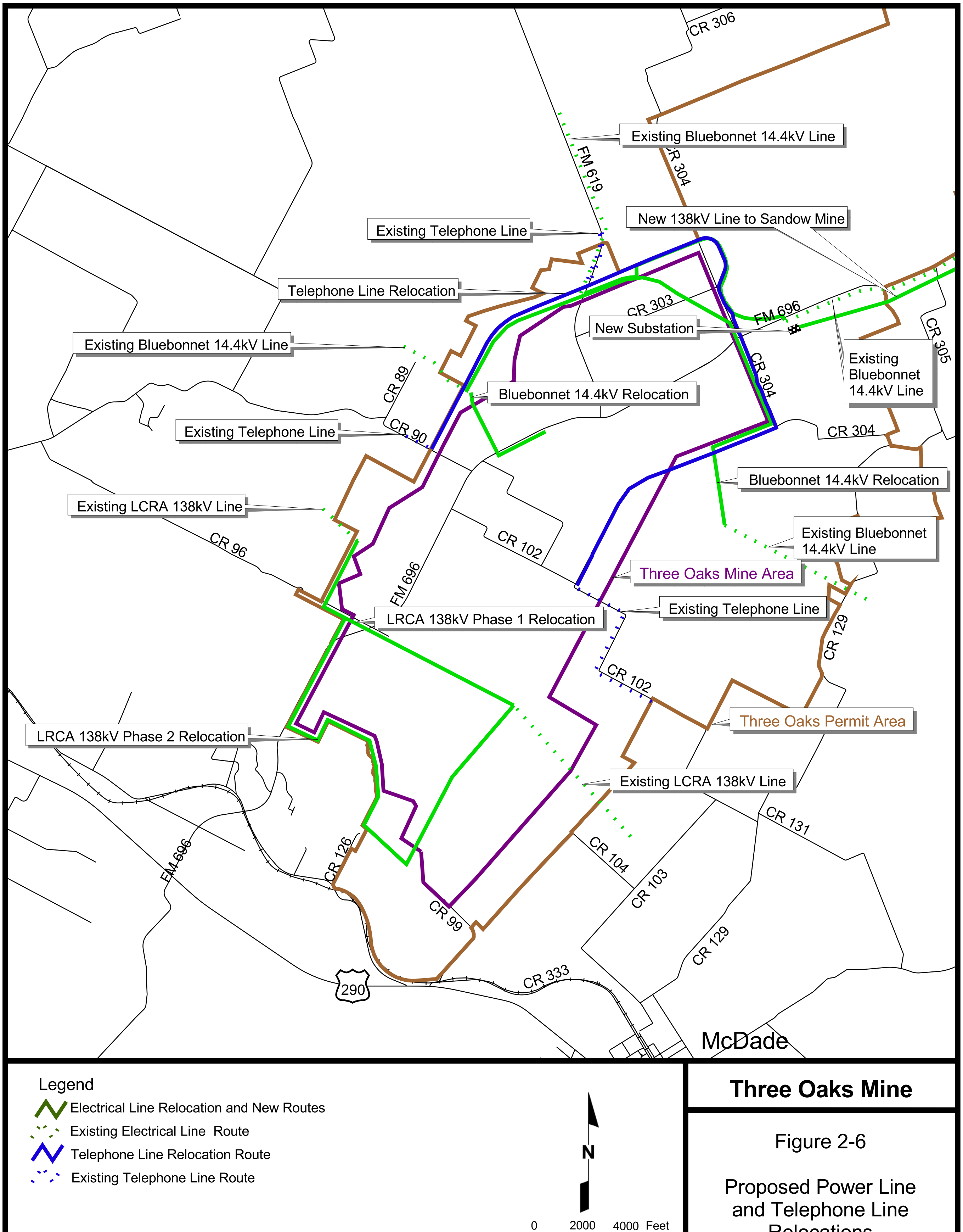

Source: Adapted from Alcoa 2001c.

Three Oaks Mine

Figure 2-6

Proposed Power Line and Telephone Line Relocations

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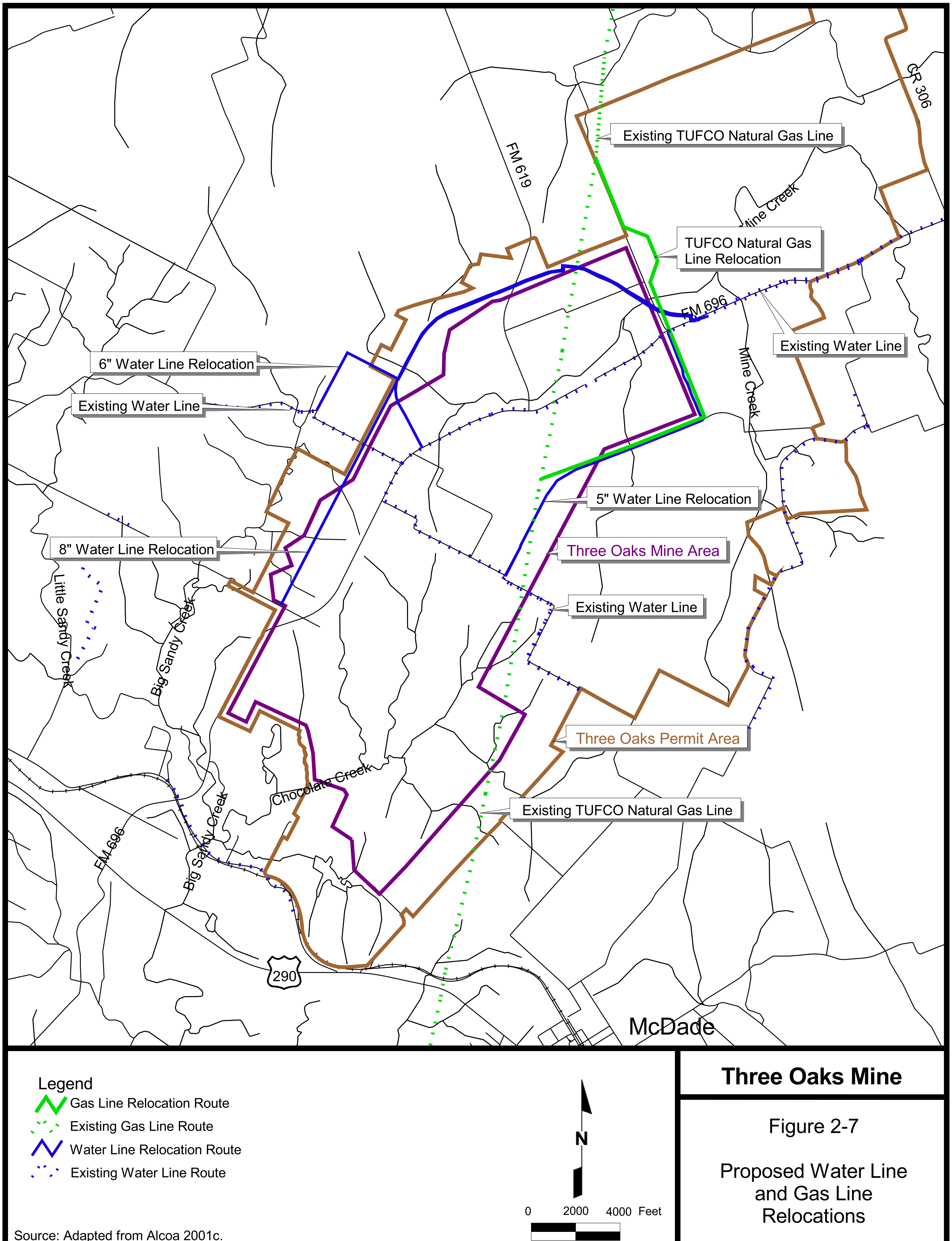


Three Oaks Mine

Figure 2-7

Proposed Water Line and Gas Line Relocations

6/19/02

Table 2-7
Public Road Modifications for Road Segments Within and Adjacent to the Three Oaks Mine

Road Name	Mine Year	Activity[1]
Farm-to-Market Roads		
FM 619	1	Temporary reroute, install grade separator[2]
FM 696	1, 3	Reroute, install grade separator[2]
Bastrop County Roads		
CR 89	1	Upgrade, extend
CR 90	1	Close[3]
CR 96	1, 3	Close[3]
CR 99	23-25	Truncate end of roadway
CR 101	3, 22-23	Upgrade, extend, close in final mine stage
CR 102	3, 5, 10, 15, 20	Extend, reroute
Lee County Roads		
CR 303	1	Reroute
CR 304	1, 3, 21-25	Upgrade, reroute, install grade separator[2]
CR 306	1	Install grade separator[2]
CR 312	1	Install grade separator[2]
CR 313	1	Rerouted under Sandow Mine approved Permit No. 1E

[1]Old sections of FM 696, CR 96, CR 102, and CR 303 and the temporary reroute of FM 619 would be closed incrementally between mine years 1 and year 5. Closures only would occur following construction of reroutes to provide for the traveling public.
[2]Grade separators (overpasses) would be installed to provide separation of mine traffic from public roads.
[3]The road segment south of the FM 696 reroute would be closed once the reroute construction has been completed.

Source: Alcoa 2001c (Volume 4); Hodges 2001.

Table 2-8
Utility Relocations by Year

Utility	Mine Year
TUFCO 20-inch gas pipeline	1
Seminole two 14-inch gas pipelines	1
Bluebonnet 14.4-kilovolt (kV) power line	1, 3
LCRA 138-kV power line	1 (phase 1), 16 (phase 2), 30
Aqua Water Supply Corporation water line	1
Verizon telephone line	1
GTE telephone and fiber optic cables	1

Source: Alcoa 2001b (Volume 4); Hodges 2001.

Three Oaks Mine

Figure 2-8

Proposed Haul Road
Crossing of County Road

Source: Hodges 2002.

6/14/02

These phases are not mutually exclusive, and various activities associated with each phase would occur concurrently in different portions of the mine area. The three phases are discussed in detail in the following sections.

2.5.1 Construction Phase

Upon receipt of all required local, state, and federal permits, Alcoa would commence construction of the mine. Construction activities and mine components developed during this phase are described below.

2.5.1.1 Surface Water Control Facilities

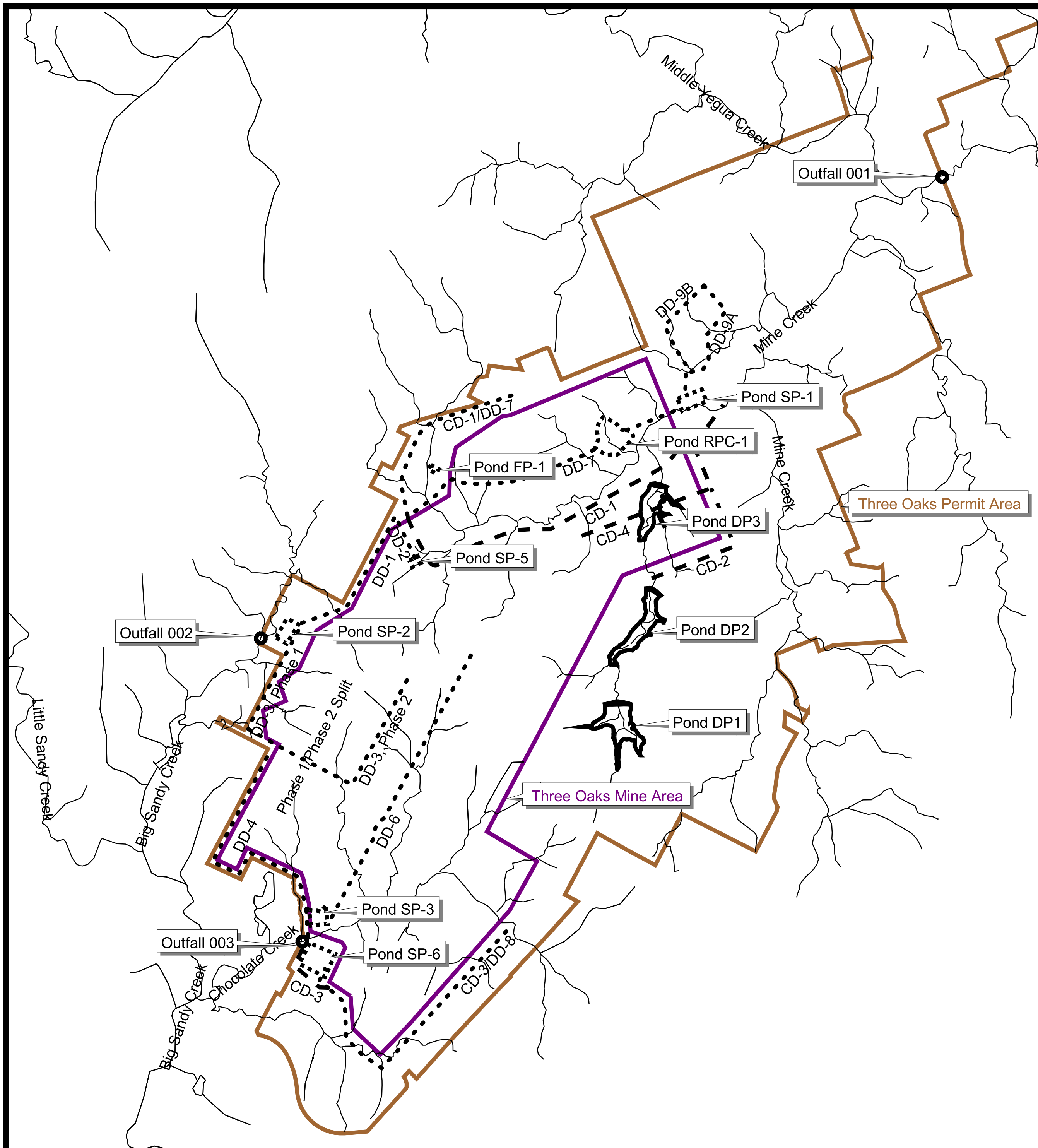
Surface water control facilities would be constructed prior to other components in order to control runoff from disturbance areas, including the initial mining area, support facilities, and infrastructure area. These facilities would include a combination of diversion ditches, sediment ponds, and other control structures or techniques designed to minimize erosion and control surface water quality discharged from the site (see **Figure 2-9**). Each structure would be planned and constructed according to requirements of the RRC and would utilize processes currently used at the existing Sandow Mine. Structures that would be constructed during this initial phase are identified below.

- Diversion ditches CD-1, DD-1, DD-2, DD-3 (Phase 1), DD-9a, DD-9b.
- Sediment ponds SP-1, SP-2, SP-5; detention ponds DP-1, DP-2, DP-3; and facilities pond FP-1.

Other control structures or techniques that would be used include the following Best Management Practices (BMPs).

- Riprap channels.
- Check dams or low-sill weirs with plantings of wetland vegetation in the retention areas.
- Temporary vegetation in diversions.
- Booms (i.e., floating tubular devices with submerged curtain which route water in ponds) to prevent short-circuiting of surface water control facilities.
- Chemical treatment, as needed, to maintain receiving water quality.
- Managed discharges of sediment ponds to control flow.

Three outfalls (discharge locations) are proposed from the drainage control system to downstream drainages. The first proposed Texas Pollution Discharge Elimination System (TPDES) outfall (outfall 001) would involve discharges of effluent from sediment control pond SP-1 to Willow Creek, then to Mine Creek, and from there to Middle Yegua Creek, which flows to Somerville Lake and then to the Brazos River. This outfall would discharge mine seepage, groundwater seepage, storm water, and treated domestic wastewater from retention ponds in the active mining area. The remaining two outfalls (outfalls 002 and 003) would discharge mine seepage, groundwater seepage, and storm water from retention ponds in the active mining area into tributaries of Big Sandy Creek. Outfall 002 would discharge to an unnamed tributary of Big Sandy Creek, and outfall 003 would discharge to Chocolate Creek and from there to Big Sandy Creek. Big



Legend

- Undisturbed Runoff Diversion
- Disturbed Runoff Diversion
- Attenuation Pond
- Sediment Pond
- Outfall

Source: Adapted from Alcoa 2001c.

Three Oaks Mine

Figure 2-9

Surface Water Control Features

7/15/02

Sandy Creek has a man-made pond approximately 1 mile downstream of outfall 2, and a natural perennial pool is present approximately 0.5 mile downstream of outfall 003.

Discharges from the surface water control system would be monitored by Alcoa as required by TPDES permit conditions to control the quality of water released to local drainages. Water quality and flow parameters to be monitored at the outfalls include flow, total suspended solids, total iron, total dissolved solids, and pH (TNRCC 2002). Additionally, the domestic wastewater effluent would be monitored for flow, total suspended solids, biochemical oxygen demand, residual chlorine, and pH before it enters the sedimentation pond to mix with the other wastewater streams. Flow would be monitored on a daily basis and the other parameters on a weekly basis. Additional monitoring would occur in both receiving drainages below the outfall points to satisfy the requirements of the RRC regulatory program (Alcoa 2001a). This monitoring would include quarterly sampling for a broader suite of physical and chemical parameters and annual sampling for analysis of trace metals. Aside from the treatment of the domestic wastewater effluent, additional treatment measures proposed by Alcoa include the addition of flocculants, if warranted, to control total suspended and total settleable solids. Cattail (*Typha latifolia*) and giant bulrush (*Scirpus californicus*) would be planted around the perimeter of temporary sedimentation ponds to provide enhanced water quality treatment and habitat valve.

2.5.1.2 Dewatering and Depressurization Systems

Alcoa proposes to install groundwater control systems within and directly adjoining the mining area. Dewatering and depressurization wells would accomplish two distinct purposes. Dewatering wells would be installed above lignite seams to partially remove groundwater from selected water-bearing lenses. Dewatering would reduce the amount of groundwater seeping into the pit and would serve to stabilize the spoil and highwall for safety reasons and allow efficient operations. Approximately 300 small capacity (less than 50 gpm) dewatering wells would be required for the initial (5-year) mine area.

Dewatering well water (approximately 300 to 1,300 acre-feet per year), in addition to surface runoff from disturbed areas, would be routed to temporary storage ponds (i.e., sediment control ponds, existing ponds, future reclamation ponds, or other future ponds proposed for the project) within the disturbance drainage area for use in dust suppression and truck washing operations. However, if the volume of dewatering well water plus surface runoff exceeds operational needs (approximately 950 to 1,300 acre-feet per year), the excess water would be routed to and discharged from the sediment control ponds (through outfalls 001, 002, and 003) to the local tributary drainages of Middle Yegua and Big Sandy Creeks in accordance with TPDES discharge standards. Alternately, any excess dewatering well water that meets the TPDES discharge standards without treatment could be discharged directly to local drainages without routing through the sediment control ponds.

Depressurization wells would be installed in the Simsboro Formation beneath the lowest lignite seam to be mined. These wells would be pumped to reduce the head pressure in the Simsboro Formation to prevent pit floor heaving and instability of spoil and highwalls that could result in unsafe conditions for personnel or mining equipment. Approximately 30 depressurization wells are estimated to be required during the first 5 years of mining.

Approximately 0 to 11,000 acre-feet per year of depressurization well water would need to be pumped to facilitate the proposed mining activities, depending on the location of mining within the mine area (increased pumpage would be required as the mine proceeds downdip) and the amount of depressurization caused within the mine area by Simsboro pumpage of others (increased pumpage by other users may reduce pumping needs by Alcoa). Tests of water to be pumped from the Simsboro aquifer indicate that treatment would not be required to meet TPDES discharge standards. As a result, the water could be discharged through fresh water diversions or pipelines to undisturbed contributing drainages of Middle Yegua and Big Sandy Creeks rather than routing the water through the sediment control ponds. These discharge points would be within the mine permit boundary. It is assumed that half of the pumpage would be discharged into the Middle Yegua Creek drainage area and the other half would be discharged into the Big Sandy Creek drainage area. If the combined volume of dewatering well water and surface runoff is insufficient to meet operational needs such as dust suppression and truck washing (i.e., during times of low dewatering well pumpage and/or dry periods), a portion of the depressurization well water would be routed to the sediment control ponds as make-up water. Also, in the event that current water users are affected by mine-related groundwater impacts (i.e., loss of production due to groundwater drawdown or groundwater quality impacts), depressurization well water may be used to mitigate the impact (i.e., provide water to affected users).

Among other items, depressurization wells generally would include a back-up diesel generator as a power supply should electrical power be interrupted. Other support facilities for all groundwater wells would include a prepared site area, access roads, discharge pipes, and power supply lines. The wells would be constructed in accordance with all applicable laws and regulations. Water from dewatering and/or depressurization operations may be used for operational purposes including dust suppression, vehicle washing, and non-potable water systems.

2.5.1.3 Clearing and Grubbing

Once surface water control facilities are in place, removal of trees and vegetation would be completed by clearing and grubbing equipment. All areas needed for support facilities, infrastructure, and the initial mining area would be cleared. Vegetation removed from within the initial pit area would be windrowed and buried by overburden removed from the initial pit. Material removed from the support facility locations and infrastructure corridor would be windrowed and burned in accordance with air quality permits.

2.5.1.4 Prime Farmland Area Topsoil Salvage and Stockpiling

Prime farmland soil resources identified by the Natural Resource Conservation Service (NRCS) and meeting the criteria for salvage requirements under the RRC surface mining regulations would be salvaged from areas within the support facility locations and the transportation and utility corridor during the construction phase and stockpiled for use during reclamation. Areas scheduled for soil salvage include prime farmlands that have a recent history of crop production (also see Section 3.3, Soils, for additional discussion of prime farmlands). Topsoil and subsoil would be segregated and stockpiled separately for future reclamation purposes. Salvage techniques proposed by Alcoa include the use of backhoes and end-dump trucks or scrapers. Topsoil and subsoil would be salvaged to a total combined depth of 4 feet. **Table 2-9** shows the combined estimated volume of topsoil and subsoil that would be salvaged, stockpiled, and subsequently used in reclamation.

Table 2-9
Prime Farmland Soil Mass Balance

Year	Prime Farmland Soil (Mine Area) (cubic yards)				Prime Farmland Soil (Ancillary Facilities[1]) (cubic yards)			
	Salvaged	Stockpiled	Removed from Stockpile	Replaced	Salvaged	Stockpiled	Removed from Stockpile	Replaced
1	0	0	0	0	74,782	39,289	0	35,493
2	0	0	0	0	0	0	0	0
3	26,738	26,738	0	0	0	0	0	0
4	106,483	106,483	0	0	0	0	0	0
5	67,033	67,033	0	0	0	0	0	0
6-10	80,085	80,085	200,254	200,254	0	0	0	0
11-15	0	0	80,085	80,085	0	0	0	0
16-20	0	0	0	0	0	0	0	0
21-25	0	0	0	0	0	0	0	0
26-30	0	0	0	0	0	0	39,289	39,289
Totals	**280,339**	**280,339**	**280,339**	**280,339**	**74,782**	**39,299**	**39,289**	**74,782**

[1]Includes support facilities and the transportation and utility corridor.

Source: Hodges 2002.

Prime farmland topsoil and subsoil stockpiles anticipated to be left in place for more than 30 days would be marked and stabilized. Seeding and planting of stockpiled materials, which would be conducted in accordance with the project's Reclamation Plan, would be conducted no later than the first normal growing period. In addition, appropriate erosion control measures such as diversion channels and/or berms would be constructed around the stockpiles to prevent erosion from overland runoff. BMPs, such as silt fences or staked straw bales, also may be used to control sediment transport. Stockpile locations would be marked with signs identifying the material to prevent possible use of the material for other purposes.

2.5.1.5 Mine Utilities Construction

Electrical Power Supply

A 138-kV power transmission line and substation and three, single-pole 25-kV power distribution lines would be constructed to provide electric service to the mine facilities and operation. The 138-kV substation would be constructed within the Three Oaks Mine permit area adjacent to the haul road in the transportation and utility corridor and across from the area designated as the contractor yard (**Figure 2-6**). The substation, which would be connected to existing utilities at the Sandow Mine through installation of a new 138-kV power line interconnect, would provide power for the proposed 25-kV power lines. One of the 25-kV power lines would be constructed between the substation and the stockpile/blending facility to feed the crusher, stacker, and reclaim and overland conveyors. A branched 25-kV line would be constructed southward from the substation. One branch would be constructed between the substation and the mine maintenance and office area. Additional branches would extend into the pit area to feed the two draglines and supporting dewatering systems. In addition, a short span would be constructed to provide power to the offices at the contractor yard.

Telephone Service

Telephone service would be provided to the facilities area of the Three Oaks Mine by extending phone lines from Sandow. These lines would be buried within the transportation and utility corridor as well as throughout the proposed facilities area, as needed.

Water Supply

Separate water supplies would be used at the Three Oaks Mine to service potable and non-potable needs. Potable water would be obtained from the local municipal water supplier. Alcoa plans to provide the water supply for non-potable uses from surface water runoff and dewatering and/or depressurization operations that would be constructed as part of the mining operation. Non-potable water would be required for various applications, including dust control on haul roads and within the lignite handling system, equipment and facilities wash-down, and fire sprinkler and fighting systems. The typical non-potable consumptive water use for the Three Oaks Mine would be approximately 600 to 800 gpm.

Water supply facilities for non-potable water would include pipelines, pumps, water storage tanks, elevated discharge structures for loading water trucks, and associated power supplies and control systems for each particular use and area. Those systems associated with dust suppression activities would be relocated as necessary throughout the life of the mine to facilitate efficient road watering throughout the mine.

Wastewater

Collection and handling of wastewater associated with both potable and non-potable water supplies would be completed in accordance with applicable permits and building codes. Two general types of wastewater would be produced by operations at the Three Oaks Mine. Sewage and gray water from lavatory and shower facilities would be collected by piping systems for transfer to an onsite sewage treatment system. The sewage treatment system would be constructed at the mine maintenance area. This system would be designed and constructed to comply with all applicable local and state regulations to ensure groundwater protection.

Wastewater associated with facilities and equipment washing would be collected by the surface water control facilities in place within the facilities area. Sediment pond FP1 (see **Figure 2-9**) would be used to recycle this wastewater where possible. Any oil contained in the wastewater would be removed by oil separation equipment prior to reuse or discharge. Discharge of excess water would be conducted in compliance with TNRCC permit conditions. Solids retained in the sediment pond would be periodically removed and disposed in the mine pit.

2.5.1.6 Transportation and Utility Corridor

There would be a transportation and utility corridor between the Three Oaks Mine and the Sandow Mine through which coal would be transported to the power plant. Alcoa is evaluating whether to transport the coal by conveyor or by haul truck. In either case, the transportation activity would be contained within the corridor connecting the two mines. The corridor would contain the main haul road, possibly a conveyor, power lines, water lines, phone lines, and lighting systems.

Three Oaks-to-Sandow Haul Road

Prior to the initiation of mining, a haul road approximately 6 miles long would be constructed to connect the stockpile/blending facility at the proposed Three Oaks Mine to the end of the haul road at Alcoa’s existing Sandow Mine. At the Three Oaks Mine site, additional haul road construction would occur between the proposed pit areas and the proposed lignite stockpile/blending facility. From that point the haul road would extend northward to the end of the Three Oaks Mine permit area where it would connect to the haul road within the adjacent Sandow Mine permit area. The Three Oaks-to-Sandow haul road would be used to relocate the draglines from the Sandow Mine to the Three Oaks Mine, and during the operations phase, the haul road would provide for lignite haulage to the existing power generating facility located near Rockdale or to a loading facility for the proposed overland conveyor. The haul road would have a travel surface width of 80 feet, maximum grades of 2.5 percent, and would be surfaced with crushed stone or other surfacing material approved by the RRC. The subgrade of the road may be stabilized using lime or bottom ash, if required, to provide a stable surface for haul road construction. The total corridor disturbance would be up to 250 feet in width along its entire length to accommodate the haul road in addition to an optional service road, conveyor, power line, and lighting system.

Construction of the Three Oaks-to-Sandow haul road would require the installation of grade separators or at-grade crossings at the intersections of CR 304, CR 306, and CR 312 and the intersection of the proposed FM 619 reroute for the safe segregation of mine traffic and public traffic. At-grade crossings at the county roads would be constructed in accordance with the requirements of the Lee County Commissioners Court; the farm-to-market at-grade crossing would be in accordance with the requirements of the TxDOT. In addition, a bridge would be constructed at the Middle Yegua Creek crossing. The bridge would be constructed in accordance with the design requirements of the TNRCC and TxDOT. Diagrams of a typical ephemeral drainage crossing and the proposed bridge over Middle Yegua Creek are shown in **Figure 2-10**. Approximately 20 culverts would be placed under the Three Oaks-to-Sandow haul road at the minor drainage channels along this route.

A series of temporary equipment “walk-arounds” would be required along the haul road to facilitate relocation of the draglines across Middle Yegua Creek and public road grade separators. The walk-arounds would be constructed of compacted fill material and would provide equipment crossing locations during construction of the haul road and protection of the road travel surfaces. Prior to placement of fill in the Middle Yegua Creek drainage, two 30-inch culverts would be installed to allow base flows to pass under the walk-around.

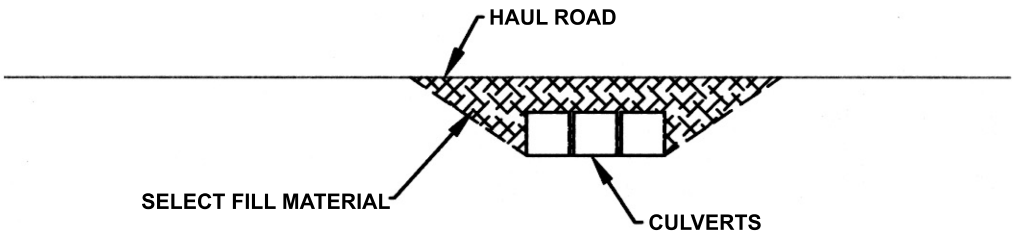
Sediment control measures, including silt fences and/or hay bales, would be utilized at the crossings. Once the equipment crosses the road or drainage, the material used to construct the walk-around would be removed and placed at the ends of the walk-around. The disturbed areas would be recontoured to match the original topography, stabilized, revegetated, and silt fences installed to reduce erosion and sedimentation. Approval would be obtained from TxDOT or the appropriate county for road crossings and from USACE for crossings of waters of the U.S. prior to construction of the walk-arounds. Alternate passage would be provided for the traveling public during the time that the roads would be blocked.

Conveyor

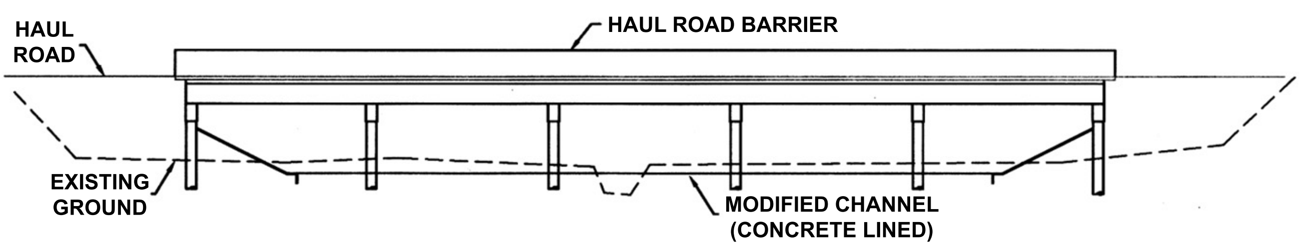
Alcoa has proposed an overland conveyor to transport lignite from the Three Oaks Mine to the power generation facility. The conveyor would be located in the transportation and utility corridor adjacent to the proposed Three Oaks-to-Sandow haul road described above and would be approximately 6 miles in length from the stockpile/blending facility to the northeast end of the permit area. The conveyor would tie into the overland conveyor system within the Sandow Mine, which would be extended to the end of the Sandow permit area as part of Sandow operations. Major components would include drive and tail pulley assemblies, loaded and empty idlers, a conveyor structure, fire suppression equipment, control systems, a cover structure, and elevated crossings to accommodate mine traffic.

The conveyor would be constructed using a continuous conveyor design that accommodates horizontal curves, eliminating intermediate transfer points. The conveyor would be covered on the top and one side by steel sheeting to reduce dust emissions. Belt cleaners and a spray wash bar at the head pulley would clean the conveyor belt after the coal is discharged. Following cleaning, the belt would be turned over for the return to the tail (loading) end of the conveyor to prevent spillage of lignite residue from the return belt. Another turnover mechanism at the tail end would restore the belt to its lignite transport configuration.

Typical Ephemeral Drainage Crossing



Middle Yegua Creek Crossing



Source: Hodges 2002.

Three Oaks Mine

Figure 2-10

Diagrams of Typical Ephemeral Drainage and Middle Yegua Creek Haul Road Crossings

6/14/02

At the proposed future Cottonwood Creek channel crossing, a dribble pan would be installed along the length of the crossing to provide secondary protection against possible spillage from upset conditions such as a broken conveyor belt.

2.5.1.7 Ancillary Support Facilities

Offices and Maintenance Area

The mine maintenance and contractor areas both would provide office space for mine employees. In addition to a newly constructed office building, the mine maintenance area would include a warehouse, maintenance buildings, welding shop, washhouse, fuel island, preventative maintenance and lubrication shop, wash rack, shop pond, parking area, and storage areas. The contractor area could consist of, but would not be limited to, office and maintenance buildings and parking and storage yards. **Figure 2-3** shows the location of the facilities required to support the mining operation.

Access Roads

Access roads would be constructed at the mine site to facilitate construction of the proposed sediment ponds. These roads would be 25 feet in width and would remain in place following construction to provide continued access for monitoring and maintenance purposes. The travel surface would be constructed of compacted clay or other RRC-approved surfacing material. Similarly, access roads would be constructed in the mine area to provide access to groundwater pump sites and other surface water control facilities and access for clearing and grubbing equipment, topsoil salvage operations, and routes for personnel safety. Asphalt or crushed stone access roads also would be constructed to the facilities areas (e.g., offices, maintenance shop, etc.). These roads would be 40 feet in width and would connect to public roads in accordance with any TxDOT design requirements.

Drainage channels and culverts, as needed, would be incorporated into all roadway construction to promote drainage along the inside edge of the road. These channels would direct precipitation and runoff to the nearest outlets or sedimentation ponds. The combined use of these channels with temporary straw bale diversions and other velocity controls, such as sediment ponds, would minimize sediment transport in runoff from high precipitation events.

Fuel and Lubricant Storage

Gasoline and diesel fuel would be stored onsite in above-ground tanks to provide fuel for mine vehicles and equipment. These tanks would be located at the mine maintenance area and would be installed within concrete spill containment structures to allow for identification and containment of accidental spills. Hydraulic fluid and lubricants (i.e., oil and grease) would be stored and used onsite for vehicle maintenance. The number and size of fuel and lubricant storage tanks are indicated in **Table 2-10**. These materials would be transported to the site in accordance with the requirements of the TxDOT and Federal Highway Administration (FHWA) and would be handled and stored in accordance with all applicable federal, state, and local laws and regulations. Waste oils and lubricants would be shipped to a licensed recycler both during construction and operation.

Table 2-10
Fuel and Lubricant Tank Storage

Fuel/Lubricant	Number of Tanks	Tank Size (gallons)
Diesel	4	25,000
10 weight oil	1	1,000
50 weight oil	1	1,000
90 weight oil	1	1,000
Gasoline	1	12,000
10 weight hydraulic oil	1	6,000
15W40 engine oil	1	6,000
50 weight gear oil	1	6,000
Waste oil	1	15,000
Antifreeze	1	2,000
Waste antifreeze	1	2,000

Source: Hodges 2001.

Refuse and Solid Waste Disposal

During construction and operation, all non-hazardous wastes would be disposed of in accordance with all applicable state and federal regulations, as well as any waste disposal permits or registrations issued for the site. Non-hazardous wastes could include paper, wood, bricks, stones, concrete, fencing materials, and other waste materials. Combustible wastes such as scrap lumber, trees, and brush debris normally would be burned onsite in accordance with TNRCC regulations (30 TAC Chapter 111, Subpart B), if approved by the county sheriff. Material that is allowed by TNRCC to be re-used for beneficial use or recycled would be recycled. This may include placing the material in the pit to bring the land back to approximate original contour. Such wastes would be buried under a minimum of 4 feet of backfill material and would be compacted through the normal process of material handling. All other non-hazardous waste would be transported to either an existing Class 2 facility permitted by TNRCC at the Sandow Mine or to a commercial landfill.

Fencing and Site Security

During the construction phase, perimeter fencing, gates, earthen berms, and appropriate signage would be installed to restrict public access to the proposed permit area. These would be maintained throughout the life of the project to restrict public access. Alcoa would have employee or contract security personnel continuously onsite throughout construction and operation.

Outside Storage

Alcoa support facilities would include outside storage of large equipment parts, wire rope, electrical trailing cable, pallets of consumable parts, conveyor belting, idlers and drums, tires, buckets, and other large repair or spare equipment needed for normal operations. The storage areas would be located at the mine maintenance and contractor areas and would be graded to control storm water drainage, finished with a graveled surface, and fenced for security.

Parking

Employee, contractor, and visitor parking areas would be part of the support facilities area. Equipment parking also would be constructed adjacent to the proposed maintenance facilities. These sites would be graded to control storm water drainage and graveled or paved, as required.

Lighting

The facilities area, as well as the transportation and utility corridor, would be equipped with lighting for safety and security reasons. Mobile light plants would be used in the pit areas as required by Mine Safety and Health Administration (MSHA) to provide for night mining activity.

2.5.1.8 Lignite Handling System

Prior to initiation of mining, facilities for lignite handling would be constructed in the stockpile and blending facilities area of the Three Oaks Mine (see **Figure 2-3**). The system would be designed to accommodate delivery of the anticipated annual lignite production, as shown in **Table 2-6**, with a maximum throughput capacity of approximately 2,000 tons per hour (tph); average throughput capacity would be approximately 1,500 tph. The lignite handling system would include the following:

- Two 350-ton capacity truck dumps;
- Two crusher stations with a throughput capacity of 2,000 tph;
- Two transfer conveyors with a capacity of 2,000 tph;
- Dust control equipment;
- Four stockpiles with a capacity of 50,000 tons each;
- Live storage of 30,000 tons;
- Two sampling systems;
- Two on-line analysis systems;
- Truck dump (existing Sandow Mine facility) located near the existing power plant facility; and
- 48-inch overland conveyor with a capacity of 1,500 tph.

2.5.1.9 Initial Mining Area

In preparation for mining, overburden would be removed from the initial mining area by draglines or mobile equipment and placed immediately northwest and adjacent to the excavated area to expose the upper lignite seam. The initial mining area would be located along the outcrop of the lignite seams in the northeast portion of the proposed mine area, as shown in **Figure 2-4**. Alcoa proposes to develop three panel areas (A, B, and C) in a phased manner. Area A, located north of FM 696, would be approximately 10,000 feet long. Lignite mining in Area A would be completed in the initial years to create an area for construction of permanent mine facilities. Area B, which would be developed during the same time frame as Area A, also would be approximately 10,000 feet long; it would extend the pit development southwest from Area A. Sequencing between Areas A and B would be necessary depending on the relocation of highway FM 619. Area C would be the last initial pit area developed. This pit would extend from the Area B pit approximately

4,000 feet to the southwest. Development of this pit would be the last of the sequence and would depend on development of Areas A and B as well as the schedule for relocation of county roads and utilities in these two mining areas. The proposed sequence is shown in **Figure 2-4**.

Selective handling of overburden is proposed for all areas. Specific engineering designs would be followed to ensure that the graded spoil from the initial pits would be sequenced so the upper 4 feet would meet the criteria for plant growth medium. All subsequent pits in each area would be approximately parallel to and downdip of the initial pit. Overburden and interburden from these pits would be graded to tie into the topography and drainage patterns established by the graded spoils from the initial pit.

Haul roads from the pit areas to the blending facilities would be constructed beginning with the initial pit. The haul roads would be located in the overburden spoil areas associated with initial pit excavation. These roads would be constructed in compliance with all MSHA regulations. Haul road grades would range from 0 to 2.5 percent with ramp sections ranging from 8 to 10 percent. Permanent sections of haul road would be surfaced with crushed stone. BMPs would be used to control fugitive dust emissions from haul road surfaces. Dust control measures may include, but would not be limited to, the use of water trucks to periodically spray the road surfaces with water and/or a chemical dust suppressant such as magnesium chloride, and periodic road maintenance to maintain compaction of the road surface. In addition, vehicle travel on roadways of primary usage would be limited based on road conditions, with traffic rerouted during extremely dusty conditions. Vehicle travel on primary roadways also would be controlled by posted speed limits.

Alcoa plans to use bottom ash material generated at the Rockdale power generating station as road surfacing material at the proposed Three Oaks Mine. The material would provide an all-weather surface for vehicular traffic. Bottom ash would be hauled by dump truck to the desired locations at the Three Oaks Mine. Distribution on road surfaces would be accomplished by scrapers or end-dump trucks. Graders would be used to level the material to a maximum depth of 6 inches. Bottom ash on temporary roads would be removed from the roadway during reclamation and placed as backfill in pit and ramp areas at a depth of 4 feet or more below the surface or disposed of at a Class 3 waste disposal site.

Prior to use of bottom ash at the proposed mine site, Alcoa would obtain TNRCC and RRC approval, as appropriate. Bottom ash is currently approved by the TNRCC for use as road surfacing on haul roads, and it is approved by the RRC for use as backfill at Alcoa's existing Sandow Mine. In advance of approval for use at that facility, it was determined by TNRCC that the bottom ash from the generating facility met the criteria for classification as a Class 3 industrial waste as defined in 30 TAC 335.507 (Alcoa 2000 [Volume 8]).

2.5.1.10 Utility and Road Relocations

Existing public roads and utilities located within the initial mine development area and the transportation and utility corridor would be relocated, as needed and agreed to by the appropriate agency or owner, prior to mining. Relocation may be permanent or temporary as site conditions and agreements require. Locations of these facilities and the proposed boundaries of the Three Oaks Mine permit area are shown in **Figures 2-5, 2-6,** and **2-7**.

Utilities

As shown in **Table 2-8**, portions of the existing LCRA 138-kV power line, Bluebonnet 14.4-kV power line, and Texas Utilities Fuel Company (TUFCO) gas pipeline would be relocated. The Seminole gas pipelines would be crossed by the haul road using RRC pipeline crossing standards. GTE telephone and fiber optic cable lines and Aqua waterlines (currently along FM 696 and CR 102) would be relocated within the rights-of-way (ROWs) of the FM 696 and CR 102 relocations, with trunk tie-ins to local services. Bluebonnet power lines and Verizon phone lines would undergo minor relocations in the vicinity of the haul road where it intersects CR 306 and CR 312. These relocations would be completed in coordination with the controlling company prior to interruption of the existing infrastructure by initial mining activities. See Section 2.5.1.5 for a description of proposed new utilities.

Public Roads

Both county and state roads would be relocated prior to initiation of construction at the proposed Three Oaks Mine (**Figure 2-5**). Preparation for mine development and construction of support facilities would require the upgrade, extension, relocation, or closure, as applicable, of certain segments of farm-to-market and county roads that occur in the proposed mine area (see **Table 2-7**). In addition, construction of grade separation crossings would be required for FM 619, FM 696, CR 304, CR 306, and CR 312. Grade separation crossings would involve an overpass over the public road for the transportation and utility corridor to address safety concerns associated with these intersections. Alcoa would coordinate all design, construction, and operations activities associated with the entity responsible for each road.

2.5.2 Operations Phase

The operations phase of the proposed project would include activities associated with the normal, steady-state mining operations through full production and up to commencement of planned closure and reclamation. The following sections describe the routine mining activities associated with this phase as well as associated infrastructure modifications, maintenance activities, and concurrent reclamation activities required at the mine.

2.5.2.1 Surface Water Control Facilities

Before and during operations, Alcoa would use BMPs to limit erosion and reduce sediment transport as a result of storm water runoff from proposed project facilities and disturbance areas. These BMPs may include, but would not be limited to, installation of erosion control devices such as sediment traps, silt fences, straw bales, and rock or gravel cover. In addition to the diversion ditches and sediment ponds installed during the construction phase, a series of additional diversions and sediment control ponds would be constructed incrementally over the life of the mine to divert and route storm water and control sediment in surface water runoff, respectively, from lands newly disturbed during advancement of the mine pits (see **Figure 2-9**). The design, construction, and operation of these facilities would be as described in Section 2.5.1.1, Surface Water Control Facilities (Construction Phase). Structures that would be constructed during various periods of the mine operation (beyond those already listed in Section 2.5.1.1) include the following:

- Sediment ponds
  SP-3 – prior to mining Contingency Areas 1 and 3
  SP-6 – year 7
  RPC-1 – year 5

- Diversion ditches
  DD-3 (Phase 2) – in second permit term, years 6 to 10
  DD-4 – prior to mining Contingency Areas 1 and 3
  DD-6 – prior to mining Contingency Areas 1 and 3
  DD-7 – year 5
  CD-2 – year 12
  CD-3/DD-8 – year 7
  CD-4 – in second permit term, years 6 to 10

In actual practice, it may become necessary for some of these structures to be constructed earlier or later than anticipated above.

Peak flows and storm event runoff volumes were projected using standard procedures, local area data, and inputs as recommended in Texas engineering literature and RRC regulations. Sediment volumes were derived by Revised Universal Soil Loss Equation (RUSLE) inputs for sheet and rill erosion, with additional gully erosion estimates. RUSLE erosion rates were estimated using a conservative soil erodibility factor, and were calculated in a manner that reflects the advance of mining and reclamation. The sediment ponds were designed to accommodate a regional sediment delivery ratio (0.43, as developed by NRCS studies) and a 3-year volume of sediment accumulation, in accordance with minimum volumes required by RRC. No sediment volumes were incorporated into the detention pond designs; however, outflows from these structures would not reflect mined-area runoff, and they also would be periodically inspected and maintained. In general, an average of approximately 640 acres of the mined area would be unvegetated at any one time as mining proceeds. Sediment derived from such areas would be collected in the appropriate ponds. In turn, these would be cleaned out and the resulting materials disposed of in the active backfill area. When these areas are reclaimed successfully, the overall sediment yield would be equal to or less than the undisturbed condition, and the ponds would be removed and reclaimed.

Proposed diversions would include ditches to convey water from undisturbed areas around the mine area and ditches to convey runoff from disturbance areas to the sediment ponds. Diversions were designed on the basis of a 10-year, 24-hour event flow (in excess of the 10-year, 6-hour flow required by RRC regulations). Sideslopes would be 4 horizonal:1 vertical. Rip-rap or concrete reinforcement would be installed, as needed, or, alternately, the ditches would be grass-lined to minimize lateral erosion and bottom scouring. Drop structures also would be incorporated, as necessary. Flow capacities of the proposed diversions would be equal to or greater than the capacities of the natural channels that would be replaced.

Revegetation of disturbed areas would further reduce the potential for erosion from disturbance areas. Following construction activities, areas such as cut-and-fill embankments, topsoil and subsoil stockpiles (if left in place longer than 30 days), and other temporary site disturbance would be seeded. All sediment and erosion controls would be inspected periodically, and maintenance would be performed as needed to ensure water quality standards are met.

2.5.2.2 Dewatering and Depressurization

During operations, additional dewatering wells would be installed, where required, in advance of the pit excavation to partially dewater overburden and interburden zones. Additional depressurization wells also would be installed to reduce the head pressure below the advancing pit, with pumpage amounts generally expected to increase as the mine advances downdip. Water pumped from these wells would be used or discharged in accordance with procedures described in Section 2.5.1.2, Dewatering and Depressurization (Construction Phase).

Dewatering wells would be decommissioned immediately prior to being mined through. Decommissioning would include removal of electrical cables, pipelines, pumps, and ancillary equipment. Dewatering wells typically would not be plugged as they would be shallower than the final depth of mining. Dewatering wells that would extend below the level of mining or were constructed adjacent to actual mine area, and depressurization wells no longer needed for mining purposes, would be plugged in accordance with RRC and TNRCC regulations or retained for non-mining purposes. If dewatering or depressurization wells are retained and the well ownership is transferred, the transfer would be in accordance with the RRC Texas Coal Mining Regulations.

Seepage and surface runoff collected in the active mine pit would be pumped to nearby sediment ponds for treatment, as needed, to meet water quality requirements of the project's TNRCC permit prior to discharge to local drainages.

2.5.2.3 Clearing and Grubbing

Clearing and grubbing to remove trees and vegetation would be conducted incrementally in advance of pit excavation. Vegetative material would be piled for subsequent removal by excavation equipment and buried along with overburden in the previously excavated pit. If approved by the county fire marshal, some combustible materials may be burned instead of being buried.

2.5.2.4 Prime Farmland Area Topsoil Removal and Replacement

During operations, topsoil and subsoil salvage operations in prime farmland areas would be conducted incrementally, where present, in advance of pit excavation. Salvage techniques, salvage depths, and stockpile stabilization and marking would be conducted as described in Section 2.5.1.4, Prime Farmland Area Topsoil Salvage and Replacement (Construction Phase). Where possible, the topsoil and subsoil would be directly replaced on regraded areas as part of the reclamation sequence. **Table 2-9** shows the combined estimated volume of topsoil and subsoil that would be salvaged and used for reclamation purposes. Also see Section 3.3, Soils, for additional discussion of prime farmlands.

2.5.2.5 Haul and Access Road Construction

Graveled haul roads would be extended in the proximity of the pit as the pit area progresses to facilitate continued mining. Additionally, access roads also would be constructed incrementally to provide access for clearing, soil salvage operations in prime farmland areas, construction, and maintenance of surface water control facilities and groundwater pump sites. The access roads and haul roads would be designed, installed, and maintained as discussed in Section 2.5.1.7, Ancillary Support Facilities (Construction Phase), and Section 2.5.1.9, Initial Mining Area (Construction Phase), respectively.

2.5.2.6 Overburden and Interburden Removal

The active mine pits would be between 2,000 and 10,000 feet in length, approximately 140 feet in width, and up to 250 feet in depth, with a typical highwall angle of approximately 50 to 75 degrees. Benches of varying heights would be established to coincide with the overburden and interburden above each lignite seam.

Following the excavation of the initial box cut, the draglines would operate from one end of the pit area to the other, placing the spoil in a previously mined-out pit as part of the land reclamation. Both highwall side and spoil side locations would be used by draglines to remove overburden and interburden material. Mobile equipment such as dozers, scrapers, backhoes, end-dump trucks, and front-end loaders also may be used for overburden and interburden removal. This equipment would be used to clean exposed lignite seams. The overburden or interburden would be placed in the end-dump trucks for transport to a previously mined-out pit. Sequential overburden and interburden removal and pit backfilling would continue throughout the life of the mine.

Alcoa's selective handling plans for overburden and interburden have been developed to ensure segregation of suitable growth medium from potentially acid forming or toxic materials naturally occurring within these geologic materials. Continuous core samples have been collected and analyzed to identify the lenses of suitable growth medium within the overburden profile. The potentially acid forming or toxic overburden and interburden materials would be placed low in the pit backfill profile, and the favorable materials would be placed in the upper part of the profile to ensure that the top 4 feet would provide a suitable growth medium. Based on the results of the core sample analyses and experience at the Sandow Mine, adequate quantities of suitable materials would be available for use as a growth medium.

Overburden and interburden material is expected to swell to a loose volume of 15 to 20 percent greater than its in-place volume after excavation. With removal of the lignite seams, sufficient space would be available within the mined-out pits to accommodate all of the overburden and interburden as backfill and meet regulatory requirements for approximate original contour.

2.5.2.7 Lignite Mining and Transport

Alcoa plans to use backhoes and front-end loaders to mine the lignite and load it into off-highway bottom-dump haul trucks. No blasting would be required. The haul trucks would transport the lignite to designated temporary stockpiles within the mine pit area, to the truck dump at the Area B crusher, or to the stockpile/blending facility that would be located north of the mine pit area but within the mine permit boundary (see **Figure 2-3**).

2.5.2.8 Lignite Handling System

The lignite stockpile/blending facility is described in Section 2.5.1.8, Lignite Handling System (Construction Phase). The Area B truck dump/crusher and a connecting transfer conveyor to the blending facility would be constructed during approximately year 4 of the operation (see **Figure 2-3**). This facility would include a hopper, crusher, and a stockpile. The Area B truck dump crusher would not be constructed until the lignite is completely removed from beneath the proposed location. Once constructed, the Area B crusher would become the primary crusher for the mine.

In order to provide the quality of lignite necessary for operation of the existing power generating facility, higher ash seams (lower quality lignite) would be blended with lower ash seams (higher quality lignite) to optimize quality (determined by percent ash, sulfur content, and energy potential or British Thermal Unit [BTU] level). Without blending, the higher ash lignite may not be useable and would become part of the mine spoil, resulting in a lower volume of recoverable lignite from the site. Lignite blending at the Three Oaks Mine would be conducted as follows:

- Lignite would be discharged from off-highway trucks into a truck dump hopper at the crusher.
- Lignite would be crushed to a nominal 6-inch size or less.
- Sampling would be conducted for quality analysis (including on-line quality analysis).
- Crushed lignite would be conveyed to one or more of the stockpiles.
- Feeders and conveyors would be used to reclaim and transport the lignite from one or more of the blended stockpiles for blending purposes.

All lignite stockpiles would incorporate appropriate erosion control measures such as diversion channels and/or berms around the stockpiles to prevent storm water run-on from surrounding areas and erosion from overland runoff from the stockpiles. BMPs, such as silt fences or staked straw bales, also may be used to control sediment transport. All perimeter disturbances would be stabilized, revegetated in accordance with the specifications in the project's Reclamation Plan, and maintained through BMPs. All lignite stockpiles would be removed either as part of the mining process or during final reclamation.

To control fugitive dust emissions from the lignite stockpile/blending facility, stockpiles periodically would be inspected for problems. Lignite may occasionally smolder or burn in the stockpiles; spontaneous combustion can occur based on moisture, humidity, and temperature conditions. Combustion is typically limited to a small area within the stockpile, usually comprising a few cubic feet of material. When smoldering material is identified from wisps of smoke, a bulldozer promptly separates the burning material, which is then extinguished by burial or water application. Water and chemical sprays would be used at lignite loading and transfer points, and the overland conveyor system would be covered to control dust. In addition, crushers would be equipped with a dust suppression system.

Crushed lignite would be placed on a covered overland conveyor or loaded into 90-ton long-haul trucks and transported via the proposed Three Oaks-to-Sandow transportation and utility corridor to the power generating station. With truck transport of lignite, an existing truck dump at the Sandow Mine would be used for transfer to the power plant. With conveyor transport of lignite, transfer to the power generating plant lignite handling facilities would occur at the existing transfer point used by current Sandow Mine operations. In both cases, existing facilities would continue to be utilized. The power generating facilities (including the three Alcoa generating units and the TXU unit) currently operate, and would continue to operate, under their existing permits as separate facilities from the Sandow Mine or the proposed Three Oaks Mine.

2.5.2.9 Equipment and Site Maintenance

Alcoa would conduct routine maintenance and repair of mine production and support equipment throughout the life of the operation. Cranes, maintenance vehicles, boom trucks, welding equipment, and service trucks would be used, as appropriate, for these tasks. Maintenance activities would include the use of lubricants, hydraulic fluids, engine coolants, and other fluids used in the industry (see **Table 2-10**). Handling and containment would be conducted in compliance with safety and health regulations and according to applicable federal, state, and local regulations for storage and transport of these fluids. Alcoa personnel would be trained in the proper handling methods and clean-up requirements and would implement such requirements should a spill occur.

Site maintenance would be completed on a routine and seasonal basis and would include: inspection and repair of drainage and sediment control facilities and installed erosion controls, routine grading and related landform maintenance to maintain site drainage patterns, the cleanout and disposal of sediment from sediment ponds and ditches, and the resurfacing of roads, as needed. Alcoa proposes to utilize onsite auxiliary equipment and contractors for these tasks.

2.5.2.10 Mine Infrastructure and Relocation Projects

Public Roads

During operations, Alcoa would conduct general mining and reclamation activities within the 100-foot buffer zone of several farm-to-market and county roads. Roads for which buffer zone variances have been requested include FM 619 and FM 696; Lee County roads CR 303, CR 304, CR 306, CR 309, and CR 312; and Bastrop County roads CR 89, CR 90, CR 96, CR 101, and CR 102. In addition to these road modifications, a relocation of Lee County road CR 313 in the transportation corridor area has already been approved under the Sandow Mine Permit No. 1E. It also is anticipated that a short length at the end of Bastrop County Road CR 99 would be truncated about year 23 to 25 of the mining operation. The general activities that would be completed to address problems with continued use of these roads may include placement of rock riprap for erosion control, modification of existing drainage structures, installation of monitor wells, and the construction of new ponds and drainage structures. Reclamation activities may include regrading, reseeding, and erosion repair. In addition, sections of several farm-to-market and county roads would be rerouted around the mining operation. These relocations would occur sequentially over a period of time in advance of pit development. Roads for which reroutes would be constructed or other modifications (i.e., upgrade, extension, closure) made are identified in **Table 2-7**. The locations of proposed road relocations are shown in **Figure 2-5**.

Grade separators (overpasses) for public road/mine road intersections would be installed, as appropriate, in any temporary portions of the relocated roads to provide safe separation of mine-related traffic from public traffic. Some or all of the abandoned pubic road segments that would be outside of the mine pit area, but within the mine permit boundary, may be used in support of mining operations. Prior approval for road reroutes and activities within road buffer zones would be obtained from the TxDOT or appropriate county authorities, as applicable.

Utilities

Several utilities would be incrementally relocated during operations. Individual utilities and the approximate time of relocation are shown in **Table 2-8**; utility relocations are shown in **Figures 2-6** and **2-7**. Relocations would be completed in coordination with the controlling company.

2.5.3 Closure and Reclamation

Reclamation would be initiated following excavation of the initial mining area and would continue concurrently with mining operations throughout the life of the mine and through final closure. The projected reclamation schedule for the Three Oaks Mine and reclaimed areas (seeded and graded) by year are shown in **Table 2-11**. The general sequence of mining and reclamation activities is depicted in **Figure 2-11**.

Immediately following the completion of mining in a given location in the mine, reclamation activities would commence and continue for approximately 2.5 years as a suitable land surface is created and reseeded. Rough grading, final grading, and other proposed reclamation practices would be conducted on the land surface during that time. Restoration of the ground surface to approximate original contour is required by RRC coal mining regulations, and is conceptually designed in the permit application.

Alcoa plans to leave the spoil peak from the active pit and the adjacent peak temporarily unleveled for the purposes of safety and surface water control. Leveling with large equipment close to the active pit could cause slope stability and equipment conflict problems (draglines versus dozers and scrapers). In many circumstances, leaving these two peaks temporarily undisturbed prevents surface water runoff from the reclaimed area from flowing into the active pit area.

Alcoa's mine plans indicate that the pits at the Three Oaks Mine may take up to 5 months to mine. **Figure 2-11** depicts Alcoa's plans for leveling the spoil peaks. The figure shows the angles of the highwall, dragline bench, and spoil peaks. The dragline bench width would be 140 feet. The figure also shows the location of the previously mined pits and indicates the amount of time that would pass following final coal removal in each of those pits. As indicated in **Figure 2-11**, the lag that would occur between the time mining commences for a given pit and the rough leveling of the spoil directly above the same pit to approximate original contour would be approximately 25 months. At the time an active pit is completed, the oldest portion

Table 2-11
Reclamation Schedule for Mined Area

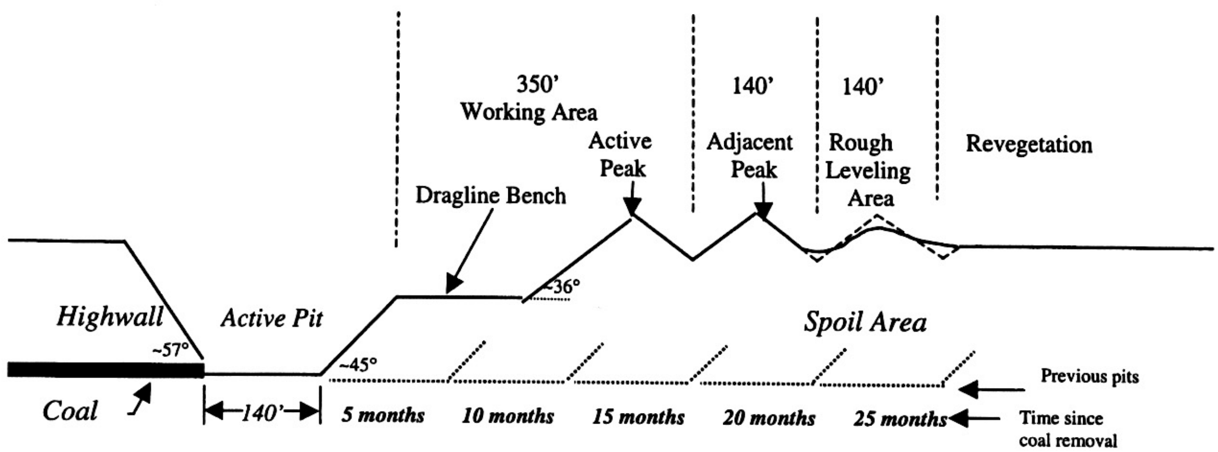
Mine Year	Total Mined	Total Rough Graded	Total Final Graded	Total Revegetated	Awaiting Bond Release[1]	Cumulative Mined	Cumulative Revegetated	Difference
January-01	575	0	0	0	0	575	0	575
January-02	314	0	0	0	0	889	0	889
January-03	248	527	287	192	0	1,136	192	945
January-04	242	336	444	488	0	1,379	679	699
January-05	314	253	281	292	479	1,693	971	721
January-06	283	243	245	246	358	1,976	1,217	758
January-07	283	308	278	266	738	2,258	1,483	775
January-08	283	285	298	304	601	2,541	1,787	754
January-09	283	283	283	283	561	2,824	2,070	754
January-10	283	283	283	283	531	3,107	2,353	754
January-11	233	283	283	283	585	3,339	2,635	704
January-12	233	283	283	283	1,050	3,572	2,918	654
January-13	233	237	258	266	924	3,804	3,184	620
January-14	233	233	233	233	825	4,037	3,417	620
January-15	233	233	233	233	767	4,270	3,649	620
January-16	213	233	233	233	818	4,482	3,882	600
January-17	213	233	233	233	762	4,695	4,115	581
January-18	213	215	223	226	749	4,908	4,341	568
January-19	213	213	213	213	749	5,121	4,553	568
January-20	213	213	213	213	732	5,334	4,766	568
January-21	226	213	213	213	729	5,560	4,979	581
January-22	226	213	213	213	670	5,787	5,192	595
January-23	226	225	220	217	659	6,013	5,410	604
January-24	226	226	226	226	659	6,240	5,636	604
January-25	226	226	226	226	670	6,466	5,862	604
January-26	0	226	226	226	672	6,466	6,089	377
January-27	0	226	226	226	666	6,466	6,315	151
January-28	0	19	113	151	665	6,466	6,466	0
January-29	0	0	0	0	665	6,466	6,466	0
January-30	0	0	0	0	477	6,466	6,466	0
January-31	0	0	0	0	439	6,466	6,466	0
January-32	0	0	0	0	262	6,466	6,466	0
January-33	0	0	0	0	226	6,466	6,466	0
January-34	0	0	0	0	226	6,466	6,466	0
January-35	0	0	0	0	226	6,466	6,466	0
January-36	0	0	0	0	226	6,466	6,466	0
January-37	0	0	0	0	38	6,466	6,466	0
Totals	**6,466**	**6,466**	**6,466**	**6,466**	**19,404 (6,466 x 3)**		**Average**	**639**

[1]Awaiting Bond Release includes areas in each of three separate stages of bond release. Thus, total acreage shown in the column includes each acre three times, once in each stage.

Assumptions:
1. Contingency Area 1 is mined in year 5.
2. Contingency Area 2 is mined in years 6-10 (spread evenly among the 5 years).
3. Contingency Area 3 is half mined in years 6-10 and half mined in years 11-15.
4. Above acreage data include only the area of extracted coal seam, not the entire disturbance area.

Source: Hodges 2002.

Mine Operational Sequence



Source: Alcoa 2002c.

Three Oaks Mine

Figure 2-11

Mine Operational Sequence

of the active pit spoil peak would have been in place for 5 months, the adjacent spoil peak would have been in place for 10 months, and the third peak (rough leveling area) would have been in place for 15 months. Therefore, peaks would be rough leveled within approximately 15 months of their creation.

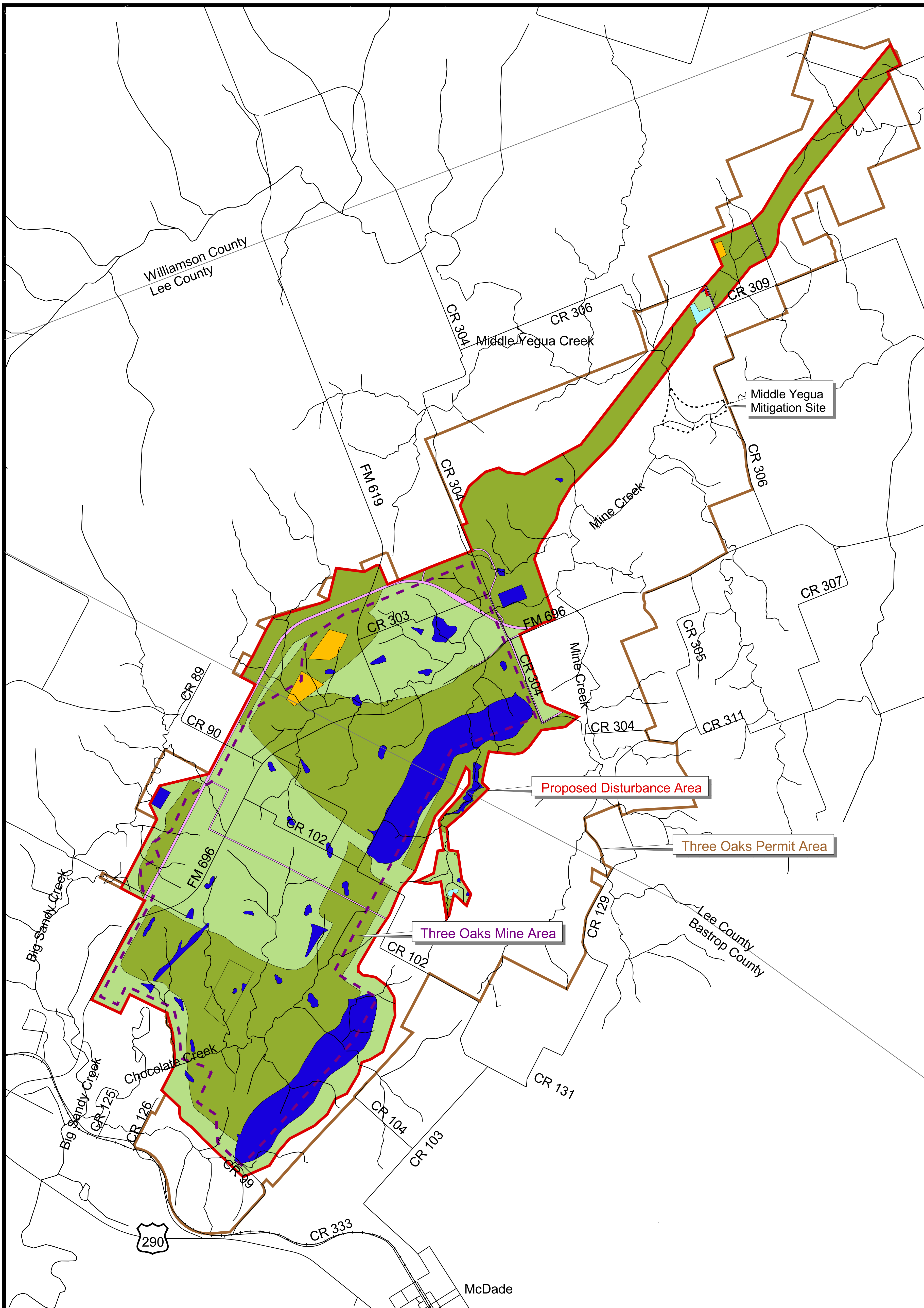
Reclamation for the proposed Three Oaks Mine would include both short-term and long-term goals for the project area. The short-term goals would include soil stabilization, maintenance of vegetative cover, providing for public safety, and promoting wildlife and livestock protection within and adjacent to the active reclamation operations. The primary objective of revegetation would be the rapid establishment of ground cover for erosion control purposes. The long-term goal of reclamation would be the establishment of a sustainable vegetative cover that would promote the desired post-mining land uses and restore the productivity of the mined land to a condition equal to or exceeding the pre-mine land uses.

Post-reclamation land uses identified for the proposed Three Oaks Mine include fish and wildlife habitat, cropland, undeveloped land, pasture land, developed water sources, industrial/commercial uses, and residential uses (single dwelling). Land use management plans would be developed by Alcoa in coordination with the jurisdictional agencies (RRC and USACE) for use as land management tools on land placed in an extended responsibility period (ERP), except for undeveloped land. The plans would be developed based on an inventory of forage resources, physical features, pre-mine yield estimates, and management objectives. Cross fences may be constructed as necessary to meet post-mining management goals and contractual agreements.

Section 12.147 of the RRC regulations requires the identification of post-mining land uses for lands that would be disturbed by the mine during the initial RRC permit term. Reclamation of the 8,648 acres of total disturbance within the RRC permit area (see **Table 2-5**) is proposed (Hodges 2002) to include 4,520 acres of wildlife habitat, 3,031 acres of pastureland, 70 acres of cropland, 895 acres of developed water resources (i.e., end lakes and small ponds to provide fish and wildlife habitat), 123 acres of industrial/commercial uses (roadways), 1 acre of residential use, and 14 acres of undeveloped land (land that will be reclaimed and on which subsequent management by the individual land owner has not been determined) (see **Figure 2-12**). Approximately 379 acres of riparian corridor would be created by planting bottomland trees along some of the restored channels and pond edges counted within the above categories. Alcoa has committed to mitigate disturbed ephemeral and intermittent watercourses at a ratio of 1:1 to 2:1 (average replacement ratio of 1.4:1, depending on habitat quality of existing stream channel); on-channel ponds at a minimum ratio of 1.5:1; and non-forested wetlands at a ratio of at least 2:1. Post-mining land uses were developed to enhance the future land use while maintaining land stability, vegetative cover, drainage, and water quality and quantity.

RRC regulations require that Alcoa post a reclamation bond equal to the estimated costs of reclamation at permit term intervals throughout the life of the mine and for the final closure site conditions. Bond monies would assure that reclamation would be completed regardless of Alcoa’s financial ability to do so.

The reclamation steps planned for and required by RRC regulations are described in the following sections.



Legend

- Cropland
- Developed Water Resources
- Fish & Wildlife Habitat
- Industrial/Commercial
- Pastureland
- Undeveloped
- Residential

Source: Alcoa 2000 (Volume 6).

N

0 2000 4000 Feet

Three Oaks Mine

Figure 2-12

Post-mine Land Uses (Conceptual)

7/19/02

2.5.3.1 Rough and Final Grading

Following selective placement of backfill (see Section 2.5.2.6, Overburden and Interburden Removal, Operations Phase) in each pit, dozers and scrapers would be utilized to create a land surface with elevations and drainage patterns that would approximate, to the extent practicable, the pre-mine topography (see **Figure 2-13**). Crawler tractors would be used to complete rough grading. Rough grading and leveling would commonly occur in the area of the third spoil ridge or peak behind the active mine pit, approximately 500 feet from the active pit, in an area that had been mined approximately 25 months earlier. The rough-graded site subsequently would be surveyed to identify areas requiring additional grading to meet surface water control, land form, and elevational requirements. Depending on the planned post-mining land use in a given area, a suitable plant growth medium or topsoil salvaged prime farmland areas would be distributed to a depth of 4 feet. Final grading and installation of erosion control structures would then be completed.

Once grading activities have been completed, the upper 4 feet of soil would be tested for suitability as a growth medium. Soil samples would be collected from a grid to a depth of 4 feet, and laboratory analyses for specific parameters as approved by RRC would be performed. If a suitable plant growth medium is present, the area would be revegetated during the next available growing season. If the soil does not meet all of the criteria for suitability, topsoil substitutes and amendments would be used to construct a suitable plant growth medium, as appropriate. If areas are identified that do not have suitable plant growth medium present in the top 4 feet of material, the unsuitable material either would be covered with suitable material or it would be hauled to an adjacent pit for burial and replaced with suitable material.

2.5.3.2 Post-mining Topography

The post-mining topography for disturbance areas associated with the proposed Three Oaks Mine is illustrated in **Figure 2-14**. Post-mining topography would be consistent with the project's established reclamation goals and proposed post-mining land uses. Recontouring would be conducted to enhance surface stability, improve drainage patterns to control surface runon and runoff, and to enhance revegetation. The result would be a post-mining topography similar in appearance and drainage pattern to the surrounding topography.

2.5.3.3 Drainage Reconstruction and Sediment Control

Some of the constructed sediment control ponds would be retained following the completion of mining to provide wildlife habitat. Sediment control ponds that would not be required to achieve the approved post-mining land uses would be removed once the associated disturbance area has been reclaimed and the surface water drainage meets applicable state and federal water quality criteria. Following removal of an impoundment, the area would be recontoured to blend with the surrounding topography and revegetated. Surface water diversions (ditches) also would be regraded and revegetated following completion of mining.

Replaced drainage channels would be configured to ensure that all ephemeral drainages upgradient of the mined area connect with and flow freely into the new drainage network. In addition, terraces and small water-holding depressions may be constructed during the reclamation phase and subsequently retained as permanent features. Waterbars and drop structures would be used where needed, and watercourses would be designed to minimize flow velocities. As part of the permanent stream restoration, temporary channels designed primarily for flood flow and erosion control would be eliminated and replaced with more natural stream channels and wooded riparian corridors that form a dendrite pattern.

An additional 28 ponds would be constructed on the reclaimed surface as mining and reclamation progress through the life of the mine. This number may vary depending on final design and approval by RRC and TNRCC. These features would be of various depths (4 to 12 feet) and sizes. It is currently expected that all of the new impoundments and retained sediment control ponds (excluding the end lakes) would total approximately 160 acres. These would be reasonably dependable water sources that could be used for wildlife habitat, livestock watering, or recreation. The conceptual locations of these features are indicated in **Figure 2-12**.

Groundwater seepage and storm water runoff from the reclaimed area would be routed through the remaining ponds and end lakes to ultimately discharge to the Middle Yegua Creek and Big Sandy Creek drainages. These discharges would be through the outfall locations described in Section 2.5.1.1 plus an additional outfall to be permitted at a later date for discharge from the South End Lake. This additional outfall would discharge into an unnamed tributary of Big Sandy Creek at the south end of the lake. Post-mining discharges through these outfalls would be monitored for flow, settleable solids, and pH in accordance with the TPDES permit requirements for the operation.

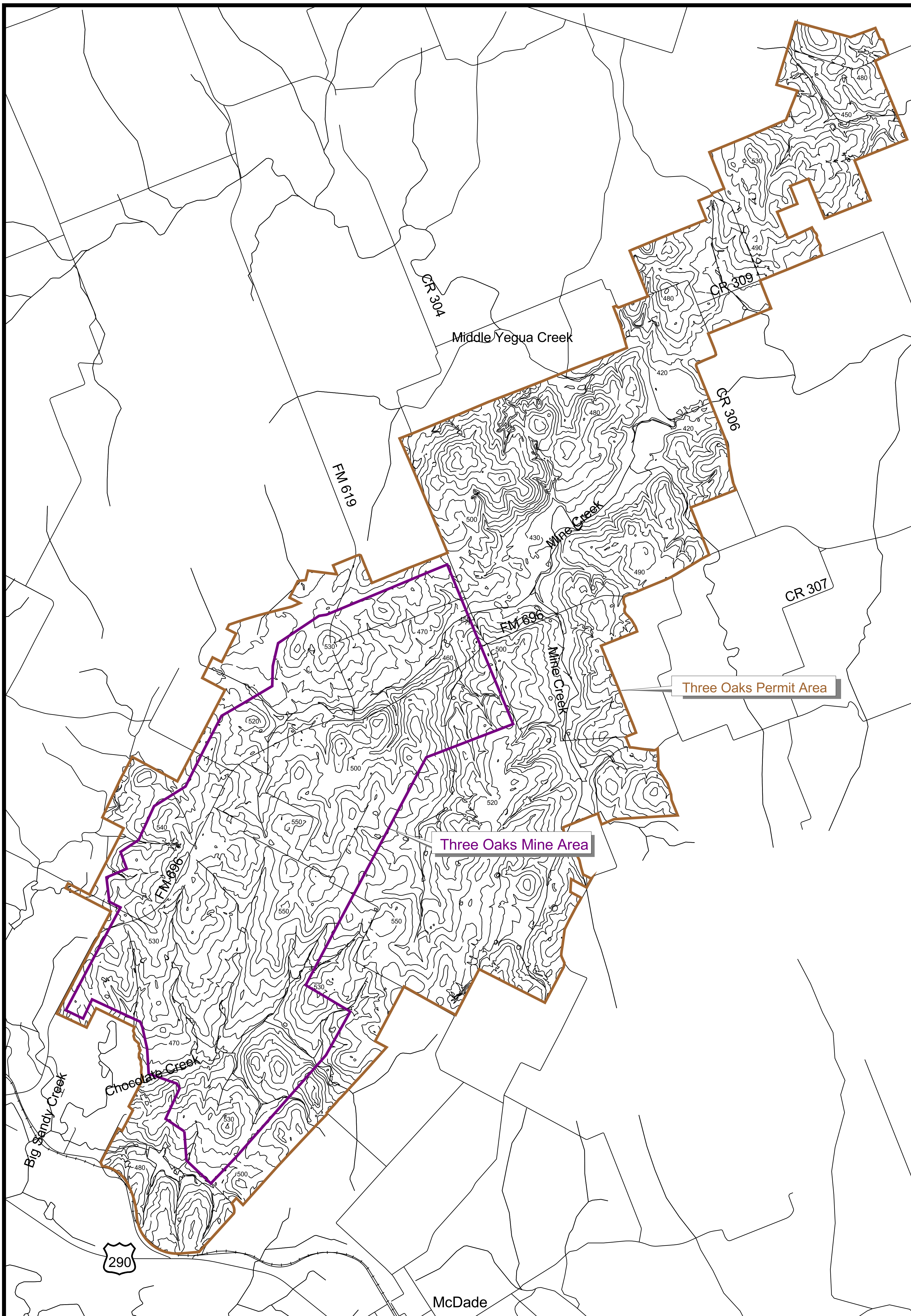
2.5.3.4 Prime Farmland Topsoil Replacement

In areas where the landform is reconstructed for use as cropland, the stockpiled or salvaged topsoil and subsoils from prime farmland areas would be replaced. Alcoa would utilize scrapers or backhoes and end-dump trucks to load, transport, and distribute subsoil and topsoil across the designated site. The volume and schedule of prime farmland soil replacement is shown in **Table 2-9**.

Measures that would be implemented to minimize excessive compaction of redistributed topsoil/subsoil would include but would not be limited to: 1) reduction of traffic as practical during redistribution operations and 2) minimization of the number of lifts needed to replace all materials. Should compaction occur, chiseling, disking, and other practices would be used to relieve compaction.

2.5.3.5 Revegetation

Areas where final grading would be completed during the summer and fall usually would be revegetated with a temporary cover; permanent revegetation would occur in the spring where required to meet post-mining land uses (i.e., wildlife habitat and pastureland). Interim revegetation also would be implemented at the topsoil and subsoil stockpiles to minimize erosion and soil loss. Concurrent reclamation activities would be conducted throughout the life of the project to minimize the need for stockpiling of growth media and subsequent re-excavation and transport to active reclamation areas.



Contour Interval: Ten Feet

Source: Adapted from Alcoa 2001c.

0 2000 4000 Feet

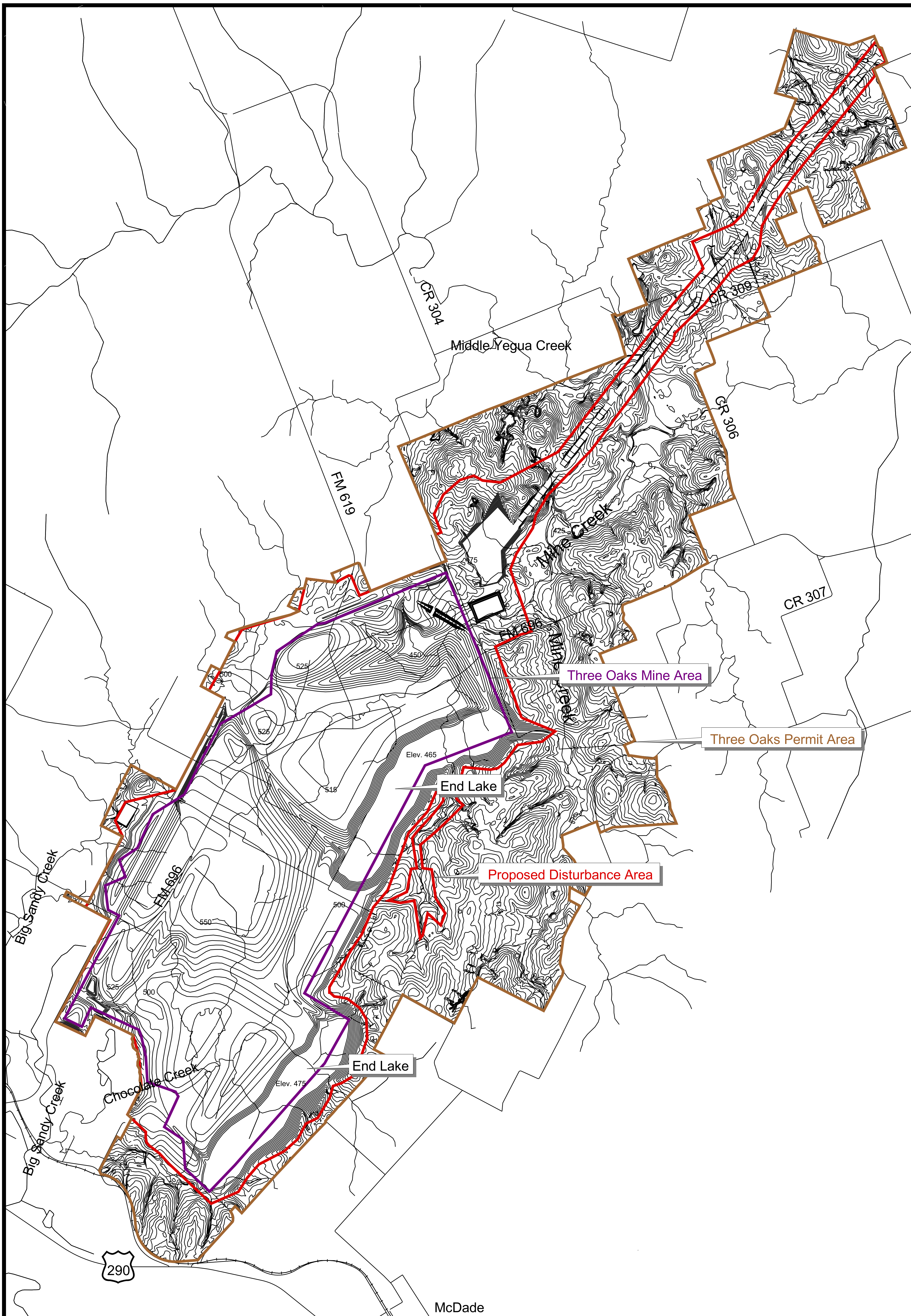
N

Three Oaks Mine

Figure 2-13

Existing Topography

6/18/02



Contour Interval: Five Feet

Source: Adapted from Alcoa 2001c.

Three Oaks Mine

Figure 2-14

Post-mining Topography (Conceptual)

N

0 2000 4000 Feet

6/19/02

Seed Mixtures

Table 2-12 lists the plant species proposed for use in reclamation of post-mining land use areas designated as fish and wildlife habitat and undeveloped land. The species planned for planting in these areas are all native. This array of species was developed with input from RRC, Texas Parks and Wildlife Department (TPWD), U.S. Fish and Wildlife Service (USFWS), NRCS, and USACE based on revegetation results at the Sandow Mine. **Table 2-13** lists the proposed application rates for herbaceous species that would be used for revegetation of the pastureland land use category. The identified species would be used to develop seed mixtures specific to post-mining land uses and would contain a complement of grasses and forbs to re-establish a diverse plant community within the reclaimed areas. Where drill seeding methods are used, seed mixtures would be applied at a rate of approximately 20 pounds of pure-live-seed (PLS) per acre. Broadcast rates would range between 30 to 40 pounds of PLS per acre.

Annual species, such as wheat, millet, rye, oats, and sorghum would be utilized as needed for temporary vegetative cover when immediate establishment of permanent vegetation would be impractical. Selection and establishment of a temporary cover would be coordinated with the planned establishment of permanent cover to ensure compatibility. Annual species would be disced for insitu mulch when permanent vegetation is planted.

Seeding and Planting Techniques

Seeding of prepared seed beds would be accomplished using various methods and equipment, depending on topographic features and soil characteristics. A combination of drill seeding methods, broadcast seeding methods, and/or other conventional means would be used.

Drill seeding equipment with depth control bands would be used for seed application on level to gently sloping areas where coarse fragment content would allow drilling operations. Seed would be uniformly distributed at appropriate seeding rates as specified in the project’s Reclamation Plan. Planting would follow the approximate contour of the land whenever possible, and seed would be firmed into the seedbed if necessary to ensure proper germination. A “no-till” planter equipped with coulters, disc openers, and packer wheels would be used on appropriate sites to plant standing cover crops or other surface mulch. This method may be used to establish permanent cover without conventional seedbed preparation.

Broadcast seeding would be employed on the few steep or rocky areas where drill seeding would not be practical. Broadcast seeding methods that would be used include tractor equipment fitted with seed boxes, hydroseeding, tractor hand seeding, and/or hand cyclone seeders. Where broadcast seeding would be used, the seed bed would be prepared by shallow ripping or dozer tracking parallel to slope contours in order to provide microsites for seed germination and to control runoff. Where possible, seeded areas would be chained, harrowed, or cultipacked to cover the seed.

Establishment of grass species that do not produce viable seed would normally be accomplished with a sprig (stolon) planter. Dormant sprigs would be used if possible and would be distributed at appropriate rates and covered with 1 to 3 inches of soil. Green sprigs would not be covered deeply and normally would be partially exposed.

Table 2-12
Reclamation Plant Species for Fish and Wildlife Habitat and Undeveloped Land Use Categories[1]

Common Name	Scientific Name	Native/Non-Native	Food/Cover[2, 3]
Hardwood Trees			
Water Hickory[4]	*Carya aquatica*	Native	Not listed
Pecan[4]	*Carya illinoensis*	Native	F-1, C-2
Black hickory[4]	*Carya texana*	Native	F-1, C-2
Sugarberry	*Celtis laevigata*	Native	F-1, C-2
Redbud	*Cercis canadensis*	Native	F-2, C-2
Texas persimmon	*Diospyros texana*	Native	F-1, C-2
Black walnut[4]	*Juglans nigra*	Native	F-1, C-2
Sweetgum	*Liquidambar styraciflua*	Native	F-2, C-2
Osage orange	*Maclura pomifera*	Native	TPWD
Red mulberry	*Morus rubra*	Native	F-1, C-2
Mexican plum	*Prunus mexicana*	Native	TPWD
Black cherry	*Prunus serotina* var. *Serotina*	Native	F-1, C-1
Texas Red Oak	*Quercus buckleyi*	Native	Not listed
Bur oak	*Quercus macrocarpa*	Native	F-1, C-1
Blackjack oak	*Quercus marilandica*	Native	F-1, C-1
Water oak[4]	*Quercus nigra*	Native	F-1, C-1
Willow oak[4]	*Quercus phellos*	Native	F-1, C-1
Shumard Oak	*Quercus shumardii*	Native	F-1, C-1
Post oak	*Quercus stellata*	Native	F-1, C-1
Live oak	*Quercus virginiana*	Native	F-1, C-1
Bald Cypress[4]	*Taxodium distichum*	Native	Not listed
Winged elm	*Ulmus alata*	Native	TPWD
Cedar elm[4]	*Ulmus crassifolia*	Native	F-2, C-1
Shrubs			
American beautyberry	*Callicarpa americana*	Native/Non-native	F-1, C-2
Buttonbush	*Cephalanthus occidentalis*	Native	F-1, C-1
Roughleaf dogwood	*Cornus drummondii*	Native	F-1, C-1
Hawthorne	*Crateagus* spp.	Native	F-1, C-1
Elbowbush	*Foresteria pubescens*	Native	F-2, C-1
Deciduous holly	*Ilex decidua*	Native	F-1, C-1
Yaupon	*Ilex vomitoria*	Native	F-1, C-1
Bayberry, Waxmyrtle	*Myrica cerifera*	Native	F-1, C-1
Honey mesquite	*Prosopis glandulosa*	Native	TPWD
Carolina buckthorn	*Rhamnus caroliniana*	Native	F-1, C-1
Fragrant sumac	*Rhus aromatica*	Native	F-1, C-1
Shining sumac	*Rhus copallina*	Native	F-1, C-1
American elderberry	*Sambucus canadensis*	Native	TPWD
Coralberry	*Symphoricarpas orbiculatus*	Native	F-1, C-1
Farkleberry	*Vaccinium arboreum*	Native	F-1, C-1
Vines			
Peppervine	*Ampelopsis arborea*	Native	F-1, C-3
Trumpet creeper	*Bignonia radicans* (or *Campsis radicans)*	Native	F-2, C-1
Carolina jessamine	*Gelsemium sempervirens*	Native	F-2, C-1
Coral honeysuckle	*Lonicera sempervirens*	Native	
Virginia creeper	*Parthenchissus quinquefolia*	Native	F-1, C-1
Dewberry, Blackberry	*Rubus* spp.	Native	F-1, C-1
Greenbriars	*Smilax* spp.	Native	TPWD
Wild grape	*Vitis* spp.	Native	F-1, C-1
Leguminous Forbs			
Partridge pea	*Chamaecrista fasciculata* (or *Cassia fasiculata*)	Native	F-1, C-3
Bundleflower	*Desmanthus* spp.	Native	F-2, C-2
Bluebonnets	*Lupinus* spp.	Native	TPWD
Nonleguminous Forbs			
Western yarrow	*Achillea millefolium*	Native	TPWD
Heath aster	*Aster ericoides*	Native	TPWD
Dayflowers	*Commelina* spp.	Native	TPWD

Table 2-12 (Continued)

Common Name	Scientific Name	Native/Non-Native	Food/Cover[2, 3]
Crotons	*Croton* spp.	Native	TPWD
Engelmann daisy	*Engelmannia pinnatifida*	Native	TPWD
Fleabanes	*Erigeron* spp.	Native	Not listed
Common sunflower	*Helianthus annus*	Native	F-1, C-1
Maximillian sunflower	*Helianthus maximiliani*	Native	F-1, C-1
Gayfeathers	*Liatris* spp.	Native	TPWD
Beebalms	*Monarda* spp.	Native	TPWD
Fleabanes	*Pluchea* spp.	Native	TPWD
Prairie coneflower	*Ratibida columnaris*	Native	TPWD
Coneflowers	*Rudbeckia* spp.	Native	TPWD
Sensitivebriar	*Schrankia nuttallii*	Native	TPWD
Grasses			
Big bluestem	*Andropogon gerardii*	Native	F-1, C-3
Broomsedge bluestem	*Andropogon virginicus*	Native	TPWD
Sideoats grama	*Bouteloua curtipendula*	Native	F-2, C-3
Green sprangletop	*Leptochloa dubia*	Native	F-3, C-3
Beaked panicum	*Panicum anceps*	Native	TPWD
Switchgrass	*Panicum virgatum*	Native	F-1, C-2
Florida paspalum	*Paspalum floridanum*	Native	TPWD
Little bluestem	*Schizachrium scoparium*	Native	F-1, C-2
Indiangrass	*Sorghastrum nutans*	Native	F-2, C-2
Prairie cordgrass	*Spartina pectinata*	Native	TPWD
Purpletop	*Tridens flavus*	Native	TPWD
Wetland and Aquatic Plants			
Sedge	*Carex* spp.	Native	F-1, C-2
Coontail	*Ceratophyllum* spp.	Native	Not Listed
Yellow nutgrass	*Cyperus esculentus*	Native	TPWD
Barnyard grass	*Echinochloa crus-galli*	Non-native	F-1, C-2
Spike rushes	*Eleocharis* spp.	Native	TPWD
Rush	*Juncus* spp.	Native	F-1, C-2
Duckweeds	*Lemna* spp.	Native	TPWD
Water primrose	*Ludwigia peploides*	Native	TPWD
Naid	*Najas* spp.	Native	TPWD
Water lotus	*Nelumbo lutea*	Native	Not Listed
Spatterdock	*Nuphar lutea*	Native	F-2, C-2
Water lily	*Nymphae odorata*	Native	F-2, C-2
Smartweed	*Polygonum* spp.	Native	F-1, C-1
Pondweed	*Potamogeton* spp.	Native	F-1, C-4
Arrowhead	*Sagittaria* spp.	Native	TPWD
Bulrush	*Scirpus* spp.	Native	F-3, C-1
Common Cattail	*Typha latifolia*	Native	F-4, C-1
Wild rice	*Zizaniopsis miliacea*	Native	F-1, C-2

[1]Additional species including those found in TPWD correspondence to RRC dated February 3, 1995 (R.C. Telfair) and Table .145-4 may be planted if they have wildlife value.
[2]Food and cover values taken from Dickson and Vance (1981). F = Food; C = Cover; 1 = Excellent; 2 = Good; 3 = Fair; 4 = Limited.
[3]TPWD recommended species listed in TPWD correspondence to RRC dated February 3, 1995 (R.C. Telfair).
[4]Denotes bottomland species.

Source: Alcoa 2001b (Volume 4); Hodges 2002b.

Table 2-13
Herbaceous Plant Species for Pastureland Land Use Category

Common Name	Scientific Name	Planting Rate (lbs/ac[1] of PLS[2])	Native or Non-native
Warm-Season Perennial Grasses			
Kaw bluestem	*Andropogon gerardi*	1-6	Native
Big bluestem	*Andropogon gerardii* var. *gerardii*	1-6	Native
Gordo bluestem	*Andropogon nodosus*	1-6	Non-native
Caucasian bluestem	*Bothriochloa caucasius*	1-6	Non-native
King Ranch yellow bluestem	*Bothriochloa ischaemum* var. *songarica*	1-6	Non-native
Spar yellow bluestem	*Bothriochloa ischaemum*	1-6	Native
Haskell sideoats grama	*Bouteloua curtipendula*	2-8	Native
El Reno sideoats grama	*Bouteloua curtipendula*	2-8	Native
Texoka buffalogrss	*Buchloe dactyloides*	2-8	Native
Burs buffalograss	*Buchloe dactyloides*	2-8	Native
Coastal sprigs-stolons	*Cynodon dactylon*	20-80 BU[2]	Non-native
Common bermudagrass	*Cynodon dactylon*	0.5-10	Non-native
Giant bermudagrass	*Cynodon dactylon*	0.5-10	Non-native
Tifton 85 sprigs-stolons	*Cynodon dactylon*	20-80 BU[2]	Non-native
NK-37 bermudagrass	*Cynodon dactylon*	0.5-10	Non-native
Alicia sprigs-stolons	*Cynodon dactylon*	20-80	Non-native
Tifton 78 sprigs-stolons	*Cynodon dactylon*	20-80	Non-native
Calle sprigs-stolons	*Cynodon dactylon*	20-80	Non-native
Brazos sprigs-stolons	*Cynodon dactylon*	20-80	Non-native
Old World T587 bluestem	*Dianchanthium* spp.	1-6	Non-native
Kleberg bluestem	*Dichanthium annulatum*	1-6	Non-native
Medio bluestem	*Dichanthium aristatum*	1-6	Non-native
Ermelo weeping lovegrass	*Eragrostis curvula*	1.5-6	Native
Common Wilman lovegrass	*Eragrostis superba*	1.5-6	Non-native
Common weeping lovegrass	*Eragrostis curvula*	1.5-6	Non-native
Renner weeping lovegrass	*Eragrostis curvula*	1.5-6	Non-native
Plains lovegrass	*Eragrostis intermedia*	1.5-6	Native
Green sprangletop	*Leptochloa dubia*	1.5-6	Native
Sel. 75 kleingrass	*Panicum coloratum*	2-6	Non-native
Verde kleingrass	*Panicum coloratum*	2-6	Non-native
Switchgrass panicum	*Panicum virgatum*	0.5-6	Native
Florida paspalum	*Paspalum floridanum*	2-6	Native
Bahiagrass	*Paspalum notatum*	2-15	Non-native
Brownseed paspalum	*Paspalum plicatulum*	2-6	Native
Carpetgrass	*Phyla nodiflora*	2-8	Non-native
Native little bluestem	*Schizachyrium scoparium* var. *frequens*	1-6	Native
Pastura little bluestem	*Schizachyrium scoparium*	1-6	Native
Knotroot bristlegrass	*Seteria geniculata*	2-6	Native
Plains bristlegrass	*Seteria leucopila* (or *macrostachya*)	2-6	Native
Giant sand dropseed	*Sporobolus cryptandrus*	0.5-4	Native
Lometa Indiangrass	*Sorghastrum nutans*	2-6	Native
Almum sorghum	*Sorghum almum*	12 COMM	Non-native
Eastern gamagrass	*Tripsacum dactyloides*	2-6	Native
Warm-Season Annual Grasses			
Japanese millet	*Echinochloa esculenta*	15 COMM[2]	Non-native
Pearl millet	*Pennisetum glaucum*	15 COMM[2]	Non-native
Foxtail millet	*Setaria italica*	15 COMM[3]	Non-native
Big German millet	*Seteria italica*	15 COMM	Non-native
Grain sorghum	*Sorghum* sp.	15 COMM	Non-native
Sorghum sudan	*Sorghum sudan*	15 COMM	Non-native
Cool-Season Annual Grasses			
Oats	*Avena sativa*	40-80 COMM[2]	Non-native
Barley	*Hordeum vulgare*	40-80 COMM	Non-native
Ryegrass	*Lolium* spp.	10-20 COMM[2]	Non-native
Rye	*Secale cereale*	40-70 COMM[2]	Non-native

Table 2-13 (Continued)

Common Name	Scientific Name	Planting Rate (lbs/ac[1] of PLS[2])	Native or Non-native
Wheat	*Triticum aestivum*	40-80 COMM[2]	Non-native
Cool-Season Forbs			
Bur clover[4]	*Medicago ploymorpha*	0.5-10 COMM	Non-native
Alfalfa[4]	*Medicago sativa*	5-20 COMM	Non-native
Red clover[4]	*Trifolium pratense*	1-20 COMM	Non-native
Burseem clover[4]	*Trifolium alexandrinum*	1-12 COMM	Non-native
Crimsom clover[3,4]	*Trifolium incarnatum*	1-20 COMM[2]	Non-native
Sweet clover[4]	*Melilotus officinalis*	0.5-10 COMM	Non-native
White clover[4]	*Trifolium repens*	0.5-10 COMM	Non-native
Subterranean clover[4]	*Trifolium subterraneum*	0.5-10 COMM	Non-native
Arrowleaf clover[3]	*Trifolium vesiculosum*	0.5-10 COMM[2]	Non-native
Austrian winter pea[3]	*Pisum sativum* var. *austrian*	10-25 COMM[2]	Non-native
Singletary winter pea[4]	*Pisum sativum*	10-25 COMM	Non-native
Vetch[4]	*Vicia* sp.	10-20 COMM	Native
Warm-Season Forbs			
Partridge pea[3]	*Chamaecrista fasciculatum*	1-40 COMM[2]	Native
Sabine Illinois bundleflower	*Desmanthus illinoensis*	1-15	Native
Common sunflower	*Helianthus annuus*	0.5-7	Native
Maximillian sunflower	*Helianthus maximiliani*	0.5-7	Native
Sericea lezpedeza	*Lezpedeza cuneata*	0.5-5 COMM[2]	Non-native
Korean lezpedeza	*Lezpedeza stipulacea*	0.5-5	Non-native
Common lezpedeza	*Lezpedeza striata*	0.5-5	Non-native
Bush sunflower	*Simsia calva*	0.5-7	Native
Native wildflowers (mix)[4]	Various species	0.5-10	Native
Iron and clay cowpeas[3]	*Vigna* spp.	1-40 COMM[2]	Non-native

[1]These planting rates presume using a drill seeding method. Broadcast seeding method rates would be double the drill seeding method rates.
[2]PLS = Pure Live Seed, BU = Bushels, COMM = Distributor's Recommendation.
[3]May be used as a filler species. May use up to 0.5 lbs/ac PLS as filler added to a full rate of base plants. When used as a part of a mixture, would not exceed 25 percent.
[4]May be used as a filler species. Use up to 0.5 PLS as a filler added to a full rate of base plants. When used as part of a mixture, do not exceed 25 percent.

Reference: Vegetation nomenclature presented in this table follows the Manual of the Vascular Plants of Texas (Correll and Johnston 1979) and the Checklist of the Vascular Plants of Texas (Hatch et al. 2001).

Source: Hodges 2001.

Cool season annuals, most often legumes, may be overseeded into established, permanent grasses. These plantings would be accomplished during the first normal planting season utilizing the appropriate selection of species, seeding rates, and planting techniques.

In upland areas, tree and shrub species generally would be planted along the contour using single row commercial planters for bare rootstock and plugs for hardwood species. Trees planted in conjunction with wetland habitat areas would be hand planted in clusters using Texas Forest Service and NRCS guidelines.

A suitable mulch would be utilized on regraded areas to aid in moisture conservation, promote germination and plant response, and/or enhance soil stabilizing conditions. Mulching techniques utilized at any given time would vary depending upon the season, gradient, soil moisture conditions, and planned permanent vegetation. Mulching techniques would include mechanical incorporation of existing plant residue into the top 6 to 8 inches of soil and application of certified weed-free straw or hay. Blocks or strips of sod may be applied directly in some rills and gullies to ensure rapid establishment and growth.

Irrigation

The need for irrigation of the revegetated areas is not anticipated beyond that necessary to extend the season for initial seed, sprig, and/or tree establishment in unusually dry years.

Seedbed Amendments

In order to provide adequate soil nutrient levels for achieving the required vegetation establishment and production rates, soil samples would be collected and analyzed for specified parameters to identify necessary fertilizer and soil amendments. Typically, application rates for nitrogen fertilizer range from 20 to 80 pounds per acre. However, soil tests and production goals would determine actual application rates.

Fertilizer materials and application rates to be used at the Three Oaks Mine would be determined on the basis of actual soil tests; however, it is expected that the following types of material would be used at various times and at various locations within the reclaimed area.

- Ammonium sulfate
- Ammonium phosphate
- Urea
- Potash
- Lime

A contractor would apply these materials in accordance with Alcoa’s specifications. Bulk fertilizer materials would not be stored at the mine site, except as needed for ongoing applications.

Pesticide Applications

Alcoa would contract with a licensed applicator to apply herbicides and insecticides as needed to ensure successful reclamation. The specific pesticides used and applications rates would be determined by the nature of problems encountered, season of use, location, and other factors. All pesticides would be applied in accordance with manufacturers' and agency instructions. The licensed applicator would prepare the spray mixtures, apply the materials, and dispose of any waste materials in an appropriate manner at an offsite facility. Bulk pesticides would not be stored at the mine site. It is expected that the following may be used at the Three Oaks Mine.

Herbicides:
- Oasis – control of Johnson grass
- Riverside Brash – weed control
- Garlon 4 – brush control in tree plots
- Oust – weed control in tree plots
- Grazon P&D – weed control

Insecticides
- Methyl parathion 4 EC – army worms

2.5.3.6 Restoration of Waters of the U.S. Including Wetlands

Alcoa has committed to long-term protection and mitigation measures related to waters of the U.S. including wetlands (Alcoa 2001c [Volume 4]; 2002a,d). These measures include reclamation of wetlands, riparian woodland along ephemeral and intermittent stream channels, and surface water features. The proposed mitigation measures include both onsite replacement of features removed within the area disturbed by mining plus creation or enhancement of additional features in an offsite protected area along Mine Creek and Middle Yegua Creek termed the Middle Yegua Mitigation Site (**Figure 2-12**). The goal of the offsite mitigation is to restore and enhance an intermittent stream floodplain to the highest quality riparian habitat within the Three Oaks Permit Area and to protect it in perpetuity. For purposes of this analysis, the USACE has assumed that through successful implementation of the proposed Mitigation Plan (Alcoa 2002d), the full area of mitigation and enhancement subsequently would meet the USACE's criteria of waters of the U.S. and constitute acceptable mitigation for the anticipated disturbances.

Ephemeral and intermittent stream channels exhibiting "ordinary high water marks" (thus, meeting the primary criteria as waters of the U.S.) within the proposed disturbance area have been evaluated and characterized as low, medium, or high quality. Low-quality streams are defined as ephemeral streams that traverse open pastureland and have minimal hydrophytic vegetation or are highly eroded. Medium-quality streams are defined as ephemeral or intermittent streams that have a narrow, relatively undisturbed vegetated corridor (woodland, native herbaceous, or hydrophytic) and that are somewhat stable. Ephemeral or intermittent streams that have a broad, mature riparian corridor vegetated by desirable woodlands are characterized as high-quality.

Low-quality ephemeral streams would be mitigated at a minimum replacement ratio of 1:1 (based on the area of affected stream channel). Medium-quality streams would be mitigated at a minimum ratio of 1.5:1 while high-quality streams would be replaced at a minimum ratio of 2:1. Channel lengths would be restored at a ratio of 1:1. Herbaceous wetlands would be mitigated at a minimum ratio of 2:1, on an area basis. On-channel ponds (qualifying as waters of the U.S.) would be reclaimed at a minimum ratio of 1.5:1, again on an area basis. **Table 2-14** presents a summary of the affected waters of the U.S., the planned mitigation ratios and areas, and the distribution of mitigation areas between the onsite mine reclamation area and the offsite Middle Yegua Mitigation Site. See Section 3.2.5 for more details regarding restoration of waters of the U.S.

2.5.3.7 Final Pit Reclamation

The land use that is proposed for the two final pits at the Three Oaks Mine is open water. It is anticipated that the final mine pits would be reclaimed as open water. The water level in the pits would be consistent with the potentiometric surface of the adjacent undisturbed Calvert Bluff Formation. This would result in two end lakes totaling approximately 722 acres in size and up to 100 feet deep. Margins of the end lake areas would be graded at a 3 horizontal:1 vertical slope to a level approximately 10 feet below the average waterlines to ensure safe access and use of the site as well as to meet requirements for reclamation. In addition, spillways would be constructed to provide for discharge to local drainages during larger storm events. The final end lakes would be designed and approved by the RRC and TNRCC prior to final closure activities. Other attributes that may be associated with the end lakes would include upland islands, a varied shoreline to encourage a wetland fringe with diversity of plant species, connections to existing riparian systems, and springtime nesting cover. In addition, bottomland tree species would be planted along portions of the pond perimeters to create additional riparian areas.

2.5.3.8 Reclamation of Ancillary Facilities and Disposition of Equipment

Closure of ancillary facilities and disposition of equipment would be conducted in compliance with applicable federal, state, and local regulations. All ancillary structures (e.g., buildings, conveyors, power lines) would be dismantled and removed from the site. Concrete foundations and pads would be broken up and covered with at least 4 feet of fill material. These sites would be recontoured to blend with the surrounding topography to the extent practical. Stockpiled prime farmland topsoil would be redistributed in appropriate areas prior to seeding. Revegetation would be completed as described in Section 2.5.3.5 in accordance with the post-mining land use. All equipment would be transported off the site.

Roads

Haulage and access roads not required for long-term monitoring and management purposes would be recontoured to blend with the surrounding topography and the natural drainage patterns. Prior to recontouring of roadways, bottom ash, where used as a road surfacing material, would be removed from the roadway and placed as backfill in the pit areas or hauled to a licensed disposal area for Class III wastes. These areas would be reclaimed in accordance with the post-mining land use.

Table 2-14
Mitigation Summary for Disturbance to Waters of the U.S.

Type of Waters of the U.S.	Disturbance Area (acres)	Replacement Ratio	Total Planned Replacement Area[1] (acres)	Mitigation in Reclamation Area (acres)	Mitigation in Middle Yegua Mitigation Site (acres)	Middle Yegua Mitigation Site Creation (acres)	Middle Yegua Mitigation Site Enhancement (acres)
Direct Impacts							
Streams							
High Quality	3.6	2:1	7.2	NA	NA	NA	NA
Medium Quality	13.3	1.5:1	20.0	NA	NA	NA	NA
Low Quality	6.7	1:1	6.7	NA	NA	NA	NA
Total Streams	**23.6**	**NA**	**33.9**	**23.6**	**10.3**	**0**	**20.6**[2]
Wetlands	5.3	2:1	10.6	5.3	5.3	5.3	0
Ponds	38.5	1.5:1	57.8	57.8	0	0	0
Subtotal	**67.4**	**NA**	**102.3**	**86.7**	**15.6**	**5.3**	**20.6**
Temporal Impacts							
Streams	23.6	0.5:1	11.8	0	11.8	0	23.6[2]
Wetlands	5.3	0.5:1	2.7	0	2.7	2.7	0
Subtotal	**(duplicative)**	**NA**	**14.5**	**0**	**14.5**	**2.7**	**23.6**
TOTAL	**67.4**	**NA**	**116.8**	**86.7**	**30.1**	**8.0**	**44.2**

[1]Some numbers in the table may deviate from exact ratios due to rounding errors from original data.
[2]Based on an enhancement factor of 2x the mitigation acreage for the Middle Yegua Mitigation Site. Acreage reflects the planned enhancement of existing wetland/riparian habitat along the existing stream channel.

Note: NA = not applicable.

Source: Data adapted from Alcoa 2002d.

Fuels and Lubricants

Following the completion of mining and reclamation, materials not consumed onsite would be returned to the supplier or shipped to a licensed recycler, as appropriate. In addition, all storage tanks for these materials would be removed and disposed of in accordance with all applicable federal, state, and local laws and regulations.

Following the completion of mining and reclamation, any remaining refuse and solid waste would be transported to and disposed of at a licensed Class III disposal facility.

Fencing and Site Security

Mining areas undergoing reclamation would be fenced, as necessary, to control public access and/or to facilitate revegetation.

2.5.3.9 Monitoring of the Reclaimed Site

A site-specific reclamation success program would be established and conducted in coordination with appropriate jurisdictional agencies throughout the life of the project. Section 12.395 of the RRC regulations addresses reclamation success criteria for the mine. Revegetation success would be monitored through evaluation of percent ground cover, tree densities, and productivity, as applicable, in relation to the site-specific post-mining land use. The program would then examine, review, and determine the effectiveness of the reclamation efforts to achieve proposed standards of reclamation success. Based on the results of the evaluation, reclamation techniques would be refined, as needed, to ensure reclamation objectives would be achieved. Criteria for determination of reclamation success by post-mining land use are presented below. Reclamation success criteria specific to the Section 404 permit that would be issued by the USACE prior to start-up also are included.

Pastureland

Under RRC regulations, ground cover must achieve at least 90 percent of the ground cover technical standards established by the NRCS, which require 95 percent cover for sod-forming grasses and 90 percent cover for bunchgrasses. Ground cover and productivity need to meet or exceed the approved standards any 2 of the first 5 years, with the exception of the first year. Production would be measured through a combination of hay harvest methods, field clipping standing forage, and/or grazing use records. Herbaceous productivity in each management unit would be measured by hay bale production. Weight tickets of trailer loads of hay would be used to determine average bale weight and total pounds of forage production per acre. Current plans would restore this land use on approximately 35.1 percent of the total disturbance area.

Fish and Wildlife Habitat

Fish and wildlife habitat areas would be monitored for percent of vegetative ground cover and tree stocking density. Tree seedlings would be planted in sufficient numbers to ensure achieving the desired community composition. In the portions of the fish and wildlife habitat type planned for forest and shrubbery restoration, the planting rate for tree and shrub species would typically be 450 to 600 stems per acre. These tree planting areas will account for approximately 75 percent of the fish and wildlife habitat land use. Ground cover in these areas would meet or exceed the technical standard of 80 percent required by the USACE. Current plans would reclaim approximately 52.2 percent of the total disturbance area to this land use.

It is anticipated that the reclaimed riparian corridors also would be approximately 75 percent wooded and 25 percent herbaceous (including hydrophytic and aquatic vegetation). Tree and shrub planting would be deemed successful with at least 50 percent survival of trees and shrubs for five consecutive growing seasons following planting. The three most dominant species of trees and shrubs must be species naturally occurring as dominant species in the area, and no species may constitute over 30 percent of the surviving tree and shrub plants.

Cropland

Production monitoring on prime farmland soils would be initiated within 10 years after completion of soil replacement. Production would be monitored during any 3 of the first 5 years following reclamation. Success of revegetation on prime farmland soils (cropland) would be determined by comparing the production of grain sorghum to a technical standard the first year of production monitoring and comparing production of hybrid bermudagrass to NRCS production standards the last 2 years of monitoring. Yields for cropland would meet or exceed the technical standard for the surrounding native prime farmland soils. Herbaceous productivity would be measured by hay bale production. Approximately 0.8 percent of the total disturbance area would be reclaimed to cropland.

Undeveloped Land

Undeveloped lands in the post-mining land use categories include those areas for which long-term management goals and uses have not been identified. These areas would be planted with native grasses, shrubs, and trees in similar fashion to the wildlife habitat. No management would be performed on the land once vegetation has been established, and natural succession would be allowed to occur.

Monitoring of undeveloped land would be based on percent ground cover and tree stocking density, where applicable. Ground cover for predominantly herbaceous species would meet or exceed 95 percent for sod grasses and 90 percent for bunchgrasses. Ground cover within areas of predominantly woody species would meet or exceed the USACE technical standard of 80 percent. Planting rates of tree species would be similar to the fish and wildlife habitat category discussed above. Undeveloped land would cover approximately 0.2 percent of the reclaimed total disturbance area.

Industrial/Commercial

Industrial/commercial land use would be restricted to the relocation of portions of CR 304 and FM 696. Ground cover within the road ROWs would be of sufficient density to provide for control of erosion. For safety reasons, trees would not be planted. This post-mine land use category would cover approximately 0.9 percent of the total disturbance area.

Residential Land

Evaluation of residential land use would be based on ground cover and tree stocking density where applicable. Ground cover within this land use would be sufficient to control erosion. If trees should be planted, Alcoa would develop site-specific standards for success in conjunction with the TPWD. Approximately 1 acre of the disturbance area would be developed as residential.

Developed Water Resources

Alcoa in coordination with the USACE would identify and inventory appropriate waters of the U.S. including wetlands reference sites for use in evaluating reclamation success for developed water resources at the Three Oaks Mine. The reference sites would be specific to the project's Section 404 permit requirements. Developed water resources would cover approximately 10.4 percent of the reclaimed total disturbance area.

2.5.4 Summary of Committed Environmental Protection Measures

Table 2-15 summarizes Alcoa's proposed environmental protection measures to reduce environmental impacts of the proposed Three Oaks Mine. In addition, **Table 2-15** identifies potential mitigation measures currently being considered by the USACE based on the environmental impacts identified in this EIS.

2.6 Past, Present, and Reasonably Foreseeable Future Actions

The evaluation of cumulative impacts associated with the proposed Three Oaks Mine is dependent on identification of those past, present, and future actions in the vicinity that cause impacts affecting the same resources and overlap in a geographic and temporal manner with the anticipated impacts from the Proposed Action. The geographic areas considered for these potentially interrelated actions vary among resources (see Chapter 3.0), since a remote activity may contribute to cumulative impacts for one resource (e.g., air quality) while not contributing to cumulative impacts for other resources that are affected primarily by site-specific activities (e.g., soils). The list below includes potentially interrelated actions likely to contribute to cumulative impacts to one or more of the resources under consideration in this EIS.

2.6.1 Past and Present Actions

The land uses surrounding the proposed Three Oaks Mine have been relatively stable over recent decades. There have been a limited number of major capital projects and reasonably steady population growth of local communities with increasing numbers of residents commuting to jobs in the Austin metropolitan area. The past and present actions anticipated to contribute to cumulative impacts to those resources affected by the proposed Three Oaks Mine are listed below (see **Figure 2-15**).

2.6.1.1 Sandow Mine Operations

The existing Sandow Mine currently supplies fuel for the Rockdale power generating station. The Sandow Mine, including associated groundwater withdrawal and discharge, is described in Section 1.1.2.1.

Table 2-15

Committed Environmental Protection Measures and Additional Mitigation Measures Under Consideration

Environmental Resource	Alcoa's Committed Environmental Protection Measures	Additional Mitigation Measures Under Consideration
Geology and Mineral Resources	• As required by RRC regulations, mine spoils would be regraded to approximate original contour prior to being revegetated.	• No additional monitoring or mitigation is being considered.
Groundwater	• In accordance with the groundwater monitoring plan required by RRC regulations, Alcoa would monitor groundwater quantity and quality in the overburden (Calvert Bluff Formation), underburden (Simsboro Formation), and spoil material at regular intervals within the permit area and the mine area. At locations more distant from the mine area or outside of the permit area, water levels would be measured in both Alcoa owned wells and privately owned wells within the area where 5 feet or more of mine-related drawdown is projected during the current 5-year RRC permit term. • Spoil well data would be evaluated to determine if acid drainage is developing, with consequent potential for pollution by toxic metals. Should the data indicate water quality problems, RRC's direction would be based on case-specific conditions and could require analysis, treatment, or cessation of operations. • Alcoa would mitigate mine-related groundwater drawdown impacts to wells as required by RRC regulations. This mitigation could require lowering of pumps, new pump installation, well deepening, or provision of an alternate water supply.	• GW-1: Baseline Monitoring. Groundwater level monitoring would begin in the Simsboro outcrop area to the west of the Three Oaks Mine at least 1 year prior to the commencement of groundwater pumping. The outcrop area encompassed by the mine-related 10-foot or greater drawdown would be monitored. Surface water features such as gaining reaches of streams, springs, seeps, and wetlands also would be monitored. This would provide documentation of baseline conditions for future use in assessing mine-related groundwater drawdown impacts as defined by the Three Oaks groundwater model, and the potential subsequent need for Alcoa to modify or replace existing private wells in accordance with RRC regulations. • GW-2: Operational Well Monitoring. Groundwater levels in the Calvert Bluff and Simsboro aquifers would be monitored on a quarterly basis, beginning at least 1 year, if possible, prior to commencement of dewatering and depressurization operations at the Three Oaks Mine. At least five monitoring wells for the Simsboro aquifer would be located in the Simsboro outcrop area to the west of the Three Oaks Mine. These five monitoring wells would encompass the projected range of drawdown in the Simsboro outcrop area out to the projected 10-foot drawdown contour. Monitoring would be on a quarterly basis for the first 5 years of operation of the Three Oaks Mine. At the end of the first 5 years of

Table 2-15 (Continued)

Environmental Resource	Alcoa's Committed Environmental Protection Measures	Additional Mitigation Measures Under Consideration
		operation, the Three Oaks life-of-mine (LOM) groundwater model would be validated against the observed drawdown in both the Calvert Bluff and Simsboro aquifers. The Three Oaks LOM groundwater model then would be recalibrated based on the 5-year drawdown data, and projections for the drawdown out to the 10-foot drawdown contour would be made for the remaining life of the mine. Following the first 5 years of operation, groundwater monitoring in the Calvert Bluff and Simsboro aquifers would be conducted on a semi-annual basis. The Three Oaks LOM groundwater model would be validated against observed drawdown every 5 years. The groundwater model would be recalibrated as needed every 5 years, and projections for drawdown out to the 10-foot drawdown contour would be made for the estimated remaining life of the mine. The position of the projected drawdown contours for the Calvert Bluff and Simsboro aquifers would be used as a guide to determine the potential mine-related impacts of dewatering and depressurization operations on private and municipal wells in these two aquifers near the Three Oaks Mine. These projections would be updated every 5 years based on recalibration of the Three Oaks LOM groundwater model to observed drawdown in these two aquifers.
Surface Water	• Surface water control facilities constructed prior to other components of the Three Oaks Mine would control runoff from disturbance areas as well as attenuate peak flows and extend periods of active stream flow following major rainfall events. • Discharges from sediment ponds would be monitored as required by TPDES permit conditions to control the quality and quantity of water released to local drainages. Treatment measures proposed by Alcoa	• SW-1: End Lake Shoreline Mitigation. During final design and implementation of end lake construction and reclamation at the proposed Three Oaks Mine, the USACE and other appropriate fish and wildlife agencies would be consulted with regard to grading and recontouring along the projected shoreline margins. This consultation would ensure

Table 2-15 (Continued)

Environmental Resource	Alcoa's Committed Environmental Protection Measures	Additional Mitigation Measures Under Consideration
	include the addition of flocculants to control total suspended and total settleable solids, as well as baffles and vegetative filters, as appropriate. • Surface drainage characteristics would be restored to approximate pre-mining locations and configurations upon the completion of mining. No perennial streams would be disturbed. • During reclamation, terraces, small water-holding depressions, waterbars, and drop structures would be installed where necessary to minimize flow velocities and control erosion. • Alcoa would construct temporary waterways, wetlands, and aquatic habitats with the following measures to mitigate temporal impacts to waters of the U.S.: – Planting cattail (*Typha latifolia*) and giant bulrush (*Scirpus californicus*) around the perimeter of temporary sedimentation ponds to provide enhanced water-quality treatment and habitat value; – Placement of small check-dams or low-sill weirs in drainage channels to sedimentation ponds; the small retention area behind the weirs would be planted with wetland vegetation for additional water-quality treatment and habitat value; and – Use of depressurization water for the creation of temporary wetlands. • Through creation of end lakes and discharge of mine water, there would be more surface water resources in the permit area during and after mining than currently exist. • Temporal impacts to waters of the U.S. would be mitigated through temporary wetland enhancements within the active mine area as well as mitigation up front in a dedicated 54-acre offsite area along Middle Yegua Creek and Mine Creek. Direct impacts would be mitigated through mine reclamation that recreates high quality streams and riparian zones along with ponds and wetlands that are similar or improved from the current condition. The 54-acre Middle Yegua Mitigation Site permanently would be protected by deed restriction.	adequate inundation of the shoreline under conditions of fluctuating end lake water levels for the protection of surface water users. • SW-2: End Lake Outlet/Channel Mitigation. During final design and implementation of end lake construction and reclamation at the proposed Three Oaks Mine, the outlet spillways and downstream channel protection measures would be configured and implemented so as to minimize the potential for channel degradation and downstream sedimentation. The measures would be constructed so as to provide long-term channel protection. • SW-3: Stream Crossing Mitigation. Prior to construction of culverts and bridge crossings for the proposed Three Oaks Mine, TNRCC and USACE would be consulted to avoid adverse changes to stream channel cross-sectional geometry and to coordinate the review and approval of BMPs. This would be done in order to minimize adverse impacts from erosion, sedimentation, and potential effects on aquatic habitat features due to cross-sectional or longitudinal modifications. • SW-4: Surface Water Flow Mitigation. Alcoa would coordinate and plan pumping discharges through the TPDES outfalls for the proposed Three Oaks Mine in a manner to provide continuous surface flows at the three outfalls to the degree possible during low-flow periods. The purpose of such coordination and planning would be to alleviate the potential impacts of groundwater drawdown on surface water low flows during the active mining phase.

Table 2-15 (Continued)

Environmental Resource	Alcoa's Committed Environmental Protection Measures	Additional Mitigation Measures Under Consideration
	• Enhancements at the Middle Yegua Mitigation Site would include excavating small shallow depressions within the floodplain; planting herbaceous hydrophytic species within the depressions; adding low rock berms and snag piles; and planting trees and shrubs throughout the corridor to enhance species diversity. • All affected streams that qualify as waters of the U.S. would be replaced in the reclaimed mine area at a 1:1 ratio of their original length. Additional mitigation would occur based on stream quality and affected area. • Low-quality ephemeral streams (defined as streams that traverse open pastureland, which support little or no hydrophytic vegetation or are highly eroded) would be mitigated at a minimum ratio of 1:1 (based on the affected area of the stream). Medium-quality streams (defined as ephemeral or intermittent streams that have a narrow, relatively undisturbed vegetated corridor and that are somewhat stable) would be mitigated at a minimum ratio of 1.5:1. Intermittent streams that have a broad, mature riparian corridor vegetated by desirable hardwoods would be considered high-quality streams and would be mitigated at a minimum of 2:1. Herbaceous wetlands would be mitigated at a minimum ratio of 2:1. On-channel ponds would be replaced at a minimum of 1.5:1. The proposed mitigation would result in mitigation areas of 6.7 acres for low-quality streams, 20.0 acres for medium-quality streams, 7.2 acres for high-quality streams, 57.7 acres for on-channel ponds, and 10.7 acres for herbaceous wetlands. • Of the total waters of the U.S. replacement acreages identified above, a minimum of 23.6 acres of streams and 5.3 acres of herbaceous wetlands would be restored in the mine reclamation area along with at least 57.7 acres of on-channel ponds. The remaining 10.3 acres of mitigation for streams and the remaining 5.4 acres of herbaceous wetlands required for mitigation would be accomplished in the Middle Yegua Mitigation Site by creation and enhancement of wetland and riparian habitat along the existing channel. Mitigation accomplished through enhancement of an existing channel or other resource would occur at an additional 2:1 acreage ratio as compared to mitigation accomplished through	

Table 2-15 (Continued)

Environmental Resource	Alcoa's Committed Environmental Protection Measures	Additional Mitigation Measures Under Consideration
	creation of new channel or wetland areas, thus enhancement for high quality stream disturbances would be conducted at an overall 4:1 ratio as opposed to a 2:1 ratio for direct replacement. • Water quality in local drainages would be protected through the construction of sediment and detention ponds, implementation of appropriate erosion and sediment control measures, and a water quality monitoring program meeting RRC and TNRCC requirements. • To increase sediment removal from the water column, cattails and giant bulrush would be planted around the perimeter of each pond within 60 days of the pond construction. Sedimentation ponds would be constructed with a shallow planting bench, 5 to 10 feet wide along the perimeter of the ponds wherever practicable. Planting benches would gently grade from the surrounding ground elevation to a depth not to exceed 2.5 feet. The planting bench would be constructed outside of the original design specifications for each pond and would, therefore, increase the capacity of each pond. • Excavation of shallow pools (1 to 1.5 feet deep) in the reconstructed or diverted stream channels would create small wetland depressions and improve sediment deposition. The elongated pools would be 20 to 40 feet long, but would not abut stream channel sideslopes to reduce the potential for erosion. The pools would be excavated at a minimum of every 500 feet along the constructed temporary stream channels and would be planted with hydrophytic vegetation. • As part of the permanent stream restoration, temporary stream channels designed primarily for flood flow and erosion control would be eliminated and replaced with more natural stream channels and wooded riparian corridors that form a dendritic pattern. The permanent stream channels would be significantly different from the temporary, trapezoidal channels. Within previously reclaimed areas, stream corridors would be cut into the broad, gentle swales that would be created post-mining. Restored streams would meander with a sinuosity that is appropriate for specific site conditions. Typical streams would have meander lengths 2 to 5 times the width of the meander. All restored streams would be constructed with one or more floodplain terraces to mimic natural conditions and to provide for a broad, wooded riparian corridor. The stream design	

Table 2-15 (Continued)

Environmental Resource	Alcoa's Committed Environmental Protection Measures	Additional Mitigation Measures Under Consideration
	includes creating braided low-flow channels within the broad stream channel base. Braided channels would maximize wet areas within the base of the constructed channel and would minimize erosive forces. Oxbows and small depressional areas also would be included to increase wetland habitats in the base of the channel. • Ponds retained or constructed on the site as part of the permanent reclamation and mitigation would be integrated into the riparian corridor design and would be constructed with one or more lower floodplain terraces designed at an elevation to be frequently flooded. Where surrounding topography allows, larger ponds would have a second terrace that is designed to be seasonally flooded. To mimic natural conditions and to prevent erosion, side slopes would be gentle (greater than 4:1). Wherever practicable, ponds would be constructed with a shallow planting bench (5 to 10 feet wide, not to exceed 2.5 feet deep) around their perimeter. Native tree, shrub, and herbaceous species would be planted throughout the planting bench and terrace(s) based on their inundation tolerance. • Any oil in the wastewater captured in Sediment Pond FP-1 at the facilities area would be removed by oil separation equipment prior to reuse or discharge of the runoff water. • Alcoa would monitor surface water flow conditions on the Simsboro outcrop adjacent to the mine. If this monitoring detects water use impacts resulting from groundwater drawdown in the Simsboro aquifer, Alcoa would mitigate the impacts. • Alcoa would use appropriate BMPs to control and minimize erosion and sediment generation during construction at any sites outside the mine area where runoff is not captured and treated by the perimeter sedimentation ponds. This includes construction of the haul road and associated "walk-arounds" at drainage crossings along the transportation corridor. • A dribble pan would be installed below the conveyor along the length of the crossing at selected drainage crossings to provide secondary protection against possible spillage from upset conditions such as a broken conveyor belt.	

Table 2-15 (Continued)

Environmental Resource	Alcoa's Committed Environmental Protection Measures	Additional Mitigation Measures Under Consideration
Soils	• Selective materials handling and testing would be implemented to ensure placement of suitable plant growth material in the upper 4 feet of the reclaimed spoil material. • Soils on prime farmlands would be salvaged, stockpiled, and replaced to a depth of 4 feet. • Stockpiles of topsoil and subsoil to be left in place more than 30 days would be marked and stabilized. A temporary cover crop, berms, silt fencing, straw bales and other BMPs would be used, as appropriate, to minimize wind and water erosion of the stockpiled materials. • Replaced soils and reconstructed topsoils would be tested to ensure that they are free of acid-forming and toxic-forming materials, and that the soil texture is favorable for the intended post-mine land use. The replaced soil or substitute material would be treated with fertilizer and amendments, as necessary, to ensure successful establishment and growth of vegetation. Testing of soil materials would be repeated at prescribed points during the reclamation bonding period in accordance with RRC requirements.	• No additional monitoring or mitigation is being considered.
Vegetation	• Revegetation would commence during the first favorable planting period after the reconstructed soils have been conditioned and prepared for planting operations. • A temporary cover crop or mulch would be established unless planting occurs in the spring, when a pre-permanent vegetative cover could be established. The use of a pre-permanent cover crop would enhance the survival and growth of the permanent vegetation species by quick establishment of organic mulch materials, high nitrogen-containing residues, and a soil-stabilizing root mass. • Within the riparian corridors of the reclamation area, the lower floodplain terrace, the upper floodplain terrace (where applicable), and the upland buffer would be planted at a minimum rate of 500 native trees and shrubs per acre. Trees and shrubs also would be planted within the base of stream channels at the reduced density of 200 per acre. Trees and shrubs would be planted by hand within scattered groupings on a minimum of 10-foot centers. A minimum of six tree species (no species would comprise more than	• V-1: Invasive Plant Species. Alcoa would coordinate with the NRCS to develop a control plan to minimize establishment of invasive plant species.

Table 2-15 (Continued)

Environmental Resource	Alcoa's Committed Environmental Protection Measures	Additional Mitigation Measures Under Consideration
	30 percent of the planted trees) and four shrub species (no species will comprise more than 30 percent of the planted shrubs) would be planted. Species would be planted at an appropriate elevation based on their inundation tolerance. To additionally enhance floodplain terrace(s) and the upland buffer, a minimum of five native grass and forb species would be seeded throughout. • Trees and shrubs would be planted throughout the Middle Yegua Mitigation Site at an average rate of 400 per acre. A minimum of eight tree species and six shrub species (no species would comprise more than 30 percent) would be planted to ensure species diversity, as well as provide food and habitat for a wide range of wildlife. The excavated depressions would be planted with herbaceous species at a rate of 400 per acre. A minimum of six hydrophytic/aquatic species (no species would comprise greater than 30 percent) would be planted. Species would be planted at an appropriate elevation based on their inundation tolerance. • Aquatic vegetation would be planted around the margins of the end lakes to promote the establishment of aquatic communities. Gradual slopes would be created down to 10 feet below the projected water level.	
Fish and Wildlife	• Disturbance of natural vegetation would be avoided, where practical, in areas scheduled for ancillary activities to minimize disturbance to wildlife habitat. • Land clearing operations would be minimized in advance of the mining operation, where practical. • Brush and other post-logging vegetative debris deemed suitable for use as brush piles would be salvaged and piled in advance of mining operations until such time as it needs to be removed so as not to interfere with mining operations. • Fish and wildlife habitat, as a percentage of the permit area, would increase during concurrent reclamation. Approximately 52 percent of the total disturbance area would be reclaimed and managed specifically as wildlife habitat, and much of the remainder would effectively serve that purpose, as well as providing pastureland for livestock.	• FW-1: Raptor Collision Protection. Standard raptor-proofing designs would be incorporated into the design of the new and relocated power lines and the new substation, as applicable, to minimize bird mortalities. • FW-2: Raptor Electrocution Protection. Standard safe designs would be incorporated into the design of the relocated 14.4-kV power line and the new 25-kV power distribution line in areas of identified avian concern to prevent electrocution of raptors. • FW-3: Aquatic Monitoring. Alcoa would monitor macroinvertebrate and fish communities in lower Big Sandy Creek.

Table 2-15 (Continued)

Environmental Resource	Alcoa's Committed Environmental Protection Measures	Additional Mitigation Measures Under Consideration
	• Woody plants would be established along reconstructed drainageways, diversions, ponds, roads, and fence lines. The configuration and distribution of plantings would be designed to maximize edge effect. Habitat diversity and interspersion of vegetation types would be encouraged by planting tree and shrub species in alternating patterns. • Alcoa's fish and wildlife plan for migrating bird species would be implemented at the Three Oaks Mine. Vegetation in proposed disturbance areas would be removed outside of the breeding season (March through July) in advance of construction and mine block development to avoid impacts to nesting birds. Alternately, prior to construction during the breeding season for bird species, a qualified biologist would survey potentially suitable habitat for nesting activity and other evidence of nesting. If active nests are located, or other evidence of nesting is observed, appropriate protection measures, including establishment of buffer areas and constraint periods, would be implemented until the young have fledged and dispersed from the nest area. • Alcoa's current protection plan for the timber/canebrake rattlesnake at the existing Sandow Mine would be implemented at the Three Oaks Mine. This plan includes employee education measures and relocation of any timber rattlesnakes found in the mine area to nearby suitable habitat outside the mine area. • The Texas horned lizard, which is state-listed as threatened, potentially could occur in the Three Oaks Mine area, although none have been observed. If the Texas horned lizard is observed or encountered in the permit area, the RRC and TPWD would be notified and a management plan would be developed and implemented in consultation with those agencies. • If other sensitive species are found at the Three Oaks Mine, protection and management plans would be developed in coordination with the jurisdictional agencies. • Groundwater discharge into the Middle Yegua Creek and Big Sandy Creek drainages would increase the quantity and dependability of	

Table 2-15 (Continued)

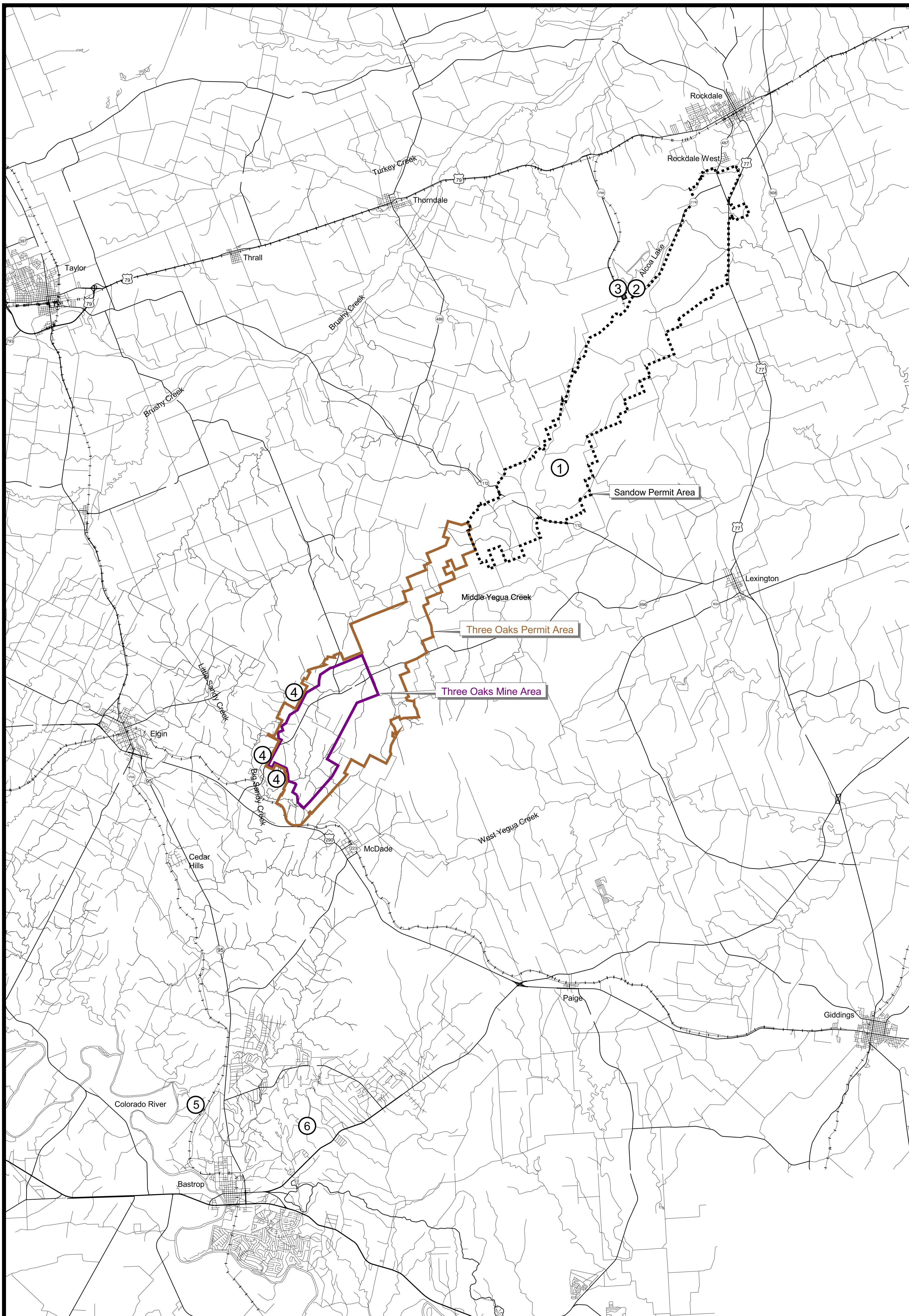
Environmental Resource	Alcoa's Committed Environmental Protection Measures	Additional Mitigation Measures Under Consideration
	flow in the upper reaches of these streams, thereby increasing the amount of aquatic and riparian habitat during the discharge period (anticipated to be the life of the mine).	
Paleontological Resources	• No environmental protection measures are proposed.	• No monitoring or mitigation is being considered.
Cultural Resources	• Alcoa would complete surveys on any remaining areas to be disturbed by mining activities prior to surface disturbance in the area. • No sites would be disturbed until written or signed approval is obtained from the THC, USACE, and RRC. • A site protection plan has been developed and would be implemented in coordination with the THC, USACE, and RRC. • In the event of unanticipated discoveries, Alcoa would contact the USACE and THC and protect the discovery in accordance with appropriate state and federal laws.	• CR-1: Indirect Impact Mitigation. Alcoa would educate personnel and implement a policy regarding illegal cultural resource collection.
Air Quality	• Alcoa would surface all haul roads with gravel and apply water or chemical dust suppressants, as needed, to minimize dust. Alcoa also would limit vehicle speeds to control dust and ensure safety. • Dust filtering devices would be included on crushers and screens, conveyors would be covered on the top and one side, transfer points would be covered, and dragline dumpling heights would be minimized to reduce fugitive dust generation. • Belt cleaners and a spray wash bar would be utilized at the head pulley of the conveyor to clean the conveyor belt after the coal is discharged. • The conveyor would be constructed using a continuous conveyor design that accommodates horizontal curves, eliminating intermediate transfer points.	• AQ-1: Haul Road Construction. Alcoa would construct an earthen berm at selected locations within the transportation corridor and gravel the haul road, relocate the haul road, or extend the permit boundary to control dispersion of particulate emissions generated on the haul road in the vicinity of the mine permit boundary.
Land Use and Recreation	• The proposed post-mine land uses would result in the restoration of the current rural character of the permit area. A majority of the reclaimed area would be dedicated to wildlife management until the bond is released. Pasture and grazing lands would be revegetated with native species and improved grasses, similar to surrounding	• No additional monitoring or mitigation is being considered.

Table 2-15 (Continued)

Environmental Resource	Alcoa's Committed Environmental Protection Measures	Additional Mitigation Measures Under Consideration
	pasturelands in the vicinity.	
Social and Economic Values	• No environmental protection measures have been proposed.	• No additional monitoring or mitigation is being considered
Transportation	• Alcoa would upgrade the transportation infrastructure in the vicinity of the mine.	• No additional monitoring or mitigation is being considered
Noise and Visual Resources	• Equipment noise effects would be reduced by maximizing the distance between the various noise sources. When possible, the equipment would be oriented such that the loudest noise sources would not be directed toward nearby residences. • Alcoa would control the view to and from public roadways through vegetative screening, berms, and undisturbed buffer areas. Alcoa would preserve existing trees where practical and plant additional vegetative screens, where necessary. • Alcoa would use shielding and directed downlighting to reduce potential glare from operating lights.	• N-1: Noise Mitigation. The noise effects at sensitive receptors would be reduced, where possible, by minimizing the simultaneous operation of major noise sources in close proximity to each other. Where possible, equipment with directional characteristics to their noise emissions would be oriented to direct the highest noise levels away from nearby residences. All motorized equipment would be maintained in good condition with effective mufflers intact. • N-2: Noise Barriers. To the degree possible, mine planning would use temporary spoil piles and topsoil stockpiles as berm-type noise barriers between mine activities and nearby residences. • N-3: Sound Control. Alcoa would investigate methods to eliminate or reduce the pure tonal character of dragline noise, believed to originate from the cooling fans • VR-1: Visual Screening. In those areas where the edge of the active mine is near the permit area boundary (e.g., portions of the western edge) and there are sensitive receptors nearby, edge conditions would be designed to minimize negative visual effects. In particular, existing vegetation would be preserved and augmented as necessary to maximize visual screening. Where possible, berms of adequate height would be placed as close to the receptor as feasible, designed to appear as an extension of the natural topography. Berming and planting

Table 2-15 (Continued)

Environmental Resource	Alcoa's Committed Environmental Protection Measures	Additional Mitigation Measures Under Consideration
		would mimic natural topography, vegetative patterns, and plant materials. Similar efforts at retaining and enhancing vegetative and topographic screening would be made at the shop/office area to soften the visual effect of the industrial buildings. Existing vegetative screening along the transportation and utility corridor would be preserved and enhanced to minimize the visual effects of the long linear feature. Overpasses would be planted with screening materials to minimize their visual impact, consistent with TxDOT safety standards. • VR-2: Landforms. Reclamation of lands and water features would employ landforms and linear characteristics mimicking those occurring naturally in the region. The post-mining, reclaimed landscape would be configured to exhibit irregular landforms and patterns consistent with the existing topography. Shrub and tree plantings would be initiated as soon as possible after recontouring the mined areas to facilitate the return of the landscape to a natural appearance.
Hazardous Materials	• Fuel storage facilities would include concrete spill containment structures to allow for identification and containment of accidental spills. • Waste oils and lubricants would be shipped to a licensed recycler during both construction and operation.	• No additional monitoring or mitigation is being considered.



Legend

1. Sandow Mine
2. Rockdale Power Generating Station
3. Rockdale Aluminum Smelter
4. Clay Mining & Brick Manufacturing
5. Powell Bend Mine
6. Lost Pines 1 and Sim Gideon Power Plants

Source: Adapted from Alcoa 2001c.

N

0 1 2 Miles

Three Oaks Mine

Figure 2-15

Potentially Interrelated Actions

6/18/02

2.6.1.2 Rockdale Power Generating Station

The existing Rockdale power generating station provides power for Alcoa's existing Rockdale aluminum smelter. The generating station includes three units owned by Alcoa and one unit owned by TXU. The existing Alcoa and TXU generating units are described in Section 1.1.2.2.

2.6.1.3 Rockdale Aluminum Smelter

Alcoa's existing aluminum smelter, located near Rockdale, has been in operation since the 1950s. Alcoa's aluminum smelter is described in Section 1.1.2.3.

2.6.1.4 Clay Mining and Brick Manufacturing Near Butler and Elgin

Brick manufacturing in the Butler/Elgin areas began in 1903 at the site of what is now the Elgin-Butler Brick Company using clay mined in the vicinity. The Elgin-Butler brick manufacturing operation employs approximately 120 workers, most of whom live in the surrounding communities. The operation covers approximately 300 acres and includes sufficient clay reserves to maintain operations for approximately 80 years. With the slow advance of pit operations, wells are not required for dewatering of the geologic materials to be removed. Elgin-Butler is permitted to discharge runoff water and seepage pumped from the pit; however, most pit water and surface runoff is used for operations. Elgin-Butler's proposed reclamation includes several small lakes with reclaimed areas sloping toward these lakes, creating a setting conducive for residential development (Elgin-Butler Brick Company 2001). U.S. Brick Hanson and Acme Brick Company also operate clay mines near Butler, but these firms did not respond to inquiries regarding their operations. Estimated current disturbance areas for all three clay operations total approximately 1,000 acres.

2.6.1.5 Powell Bend Mine

LCRA operated the Powell Bend Mine in Bastrop County from late 1984 to early 1993. Total coal production from the mine was approximately 1.6 million tons. Total disturbance associated with the mine and ancillary facilities was approximately 291 acres (Walter 2001). The mine is currently being reclaimed in accordance with RRC regulations.

2.6.1.6 Lost Pines 1 Power Plant

This 500-MW gas-fired, combined cycle generating plant is owned jointly by GenTex Power Corporation, an LCRA affiliate, and Calpine Corporation. It went into production in May 2001, and is located approximately 5 miles east of Bastrop at Lost Pines Power Park. Lake Bastrop, with an area of approximately 900 acres, was created as a cooling water pond at the Lost Pines Power Park. The plant has 21 full-time employees.

2.6.1.7 Sim Gideon Power Plant

This gas-fired generating plant owned by LCRA includes three units producing a total of 620 MW. The three units were constructed during the period of 1963 to 1971. The plant is located approximately 5 miles east of

Bastrop at Lost Pines Power Park. The Lost Pines 1 and Sam Gideon power plants together propose nitrogen oxide emission reductions from 2,300 tons at Sam Gideon in 1999 to approximately 1,200 tons from the combined plants (LCRA 2001).

2.6.1.8 Groundwater Withdrawal for the Bryan-College Station Area

Based on the report of the Carrizo-Wilcox Groundwater Flow Model and Simulation Results (R. W. Harden & Associates, Inc. [RWHA] 2000), pumpage for municipal development in the Bryan-College Station area has been ongoing since the 1950s and approximated 30,000 acre-feet per year in 2000. This pumpage is discussed in greater detail in Section 3.2.3.

2.6.1.9 Groundwater Withdrawal for Other Municipal, Industrial, and Agricultural Uses

The Carrizo-Wilcox Groundwater Flow Model and Simulation Results (RWHA 2000), considered historic groundwater pumpage in the region based on the Texas Water Development Board (TWDB) projections and other available data. Pumpage for municipal, industrial, and agricultural water uses in the region is discussed in Section 3.2.3.

2.6.1.10 Population Growth

The population of the three-county (Bastrop, Lee, and Milam) study area increased by approximately 23,600 people (32 percent) from 1990 to 2000. Growth was not spread uniformly across the area, however, as Bastrop County accounted for 19,500 people, or over 82 percent of the increase. Lee County grew by 2,800 people, and Milam County grew by 1,300 people. Average annual growth rates over the decade were 4.2 percent, 2.0 percent, and 0.5 percent for Bastrop, Lee, and Milam Counties, respectively (U.S. Census Bureau 2001).

2.6.2 Reasonably Foreseeable Future Actions

Future actions considered in this analysis include those considered to be reasonably foreseeable, rather than speculative. This categorization is based on the best available information from the agencies and proponents involved or from credible published sources. The CEQ guidelines (CEQ 1997) related to identification of reasonably foreseeable actions state that, “In general, future actions can be excluded from the analysis of cumulative effects if:

- The action is outside the geographic boundaries or timeframes established for the cumulative effects analysis;
- The action will not affect resources that are the subject of the cumulative effects analysis; or
- Including of [sic] the action would be arbitrary.”

Based on this approach, the following actions have been identified as reasonably foreseeable actions to be addressed in this EIS.

2.6.2.1 Sandow Mine Closure and Reclamation

As described in Section 1.1.2.1, the Sandow Mine is an existing lignite mining operation that has been operating since the1950s. Alcoa currently proposes to begin mine closure and reclamation in 2003; Alcoa estimates that closure and reclamation activities would be completed within approximately 5 years. These activities would include reducing the slopes of the final pit to create the final end lakes, removal of ancillary mine facilities, and final grading and revegetation of disturbed lands. Sandow Mine closure would result in the termination of groundwater dewatering and depressurization pumping and surface discharge of this water. However, 4,443 gpm of groundwater would continue to be pumped from the mine site for ongoing industrial use.

2.6.2.2 San Antonio Water System Contract

The 1998 SAWS contract is a long-range water supply contract between Alcoa and SAWS for 40,000 to 66,000 acre-feet of groundwater per year from Alcoa and CPS lands to the City of San Antonio (SAWS 1998). In 2001, SAWS revised its projected need to be approximately 40,000 acre-feet (SAWS 2001). The proposed term of water supply is from 2013 to 2038, with a possible 40-year extension. Alcoa would provide up to 40,000 acre-feet per year from depressurization wells located in the Sandow Mine area in the Simsboro Formation. Concurrently, SAWS, through a separate contract with CPS, would produce up to 15,000 acre-feet per year from the CPS property at Three Oaks. The Alcoa-SAWS contract stipulates that: 1) groundwater withdrawals for the SAWS/CPS contract may not interfere with Alcoa's lignite mining operations; 2) lignite mining may result in a reduction in groundwater provided for the contract of up to 15,000 acre-feet per year; and 3) the City of San Antonio has agreed to adhere to the same groundwater well mitigation requirements as lignite mining operations (i.e., mitigation for well impacts caused by the drawdown of groundwater pumped for SAWS) (see Section 2.5.4). Based on these stipulations, SAWS water production from CPS lands would be a maximum of 15,000 acre-feet per year inclusive of any water produced from the proposed Three Oaks Mine.

For purposes of this impact assessment, it is assumed that groundwater pumped for the SAWS contract would be conveyed via a pipeline directly from the well field to San Antonio without being discharged into any local drainages or surface impoundments.

2.6.2.3 Groundwater Withdrawal for Bryan-College Station Area

No published agency estimates are available regarding the long-term changes in groundwater withdrawal for the Bryan-College Station area. For purposes of this impact analysis, it is assumed that overall municipal water consumption rates will increase in proportion to projected population growth in the area. Estimated increases in groundwater withdrawal rates and usage from surface sources are discussed in Section 3.2.3.

2.6.2.4 Groundwater Withdrawal for Other Municipal, Industrial, and Agricultural Uses

Groundwater withdrawals in the local area encompassing Lee and Bastrop Counties, as well as for the Bryan-College Station area, are assumed to increase in response to projected population growth for these counties. Based on U.S. Bureau of Census data, these growth projections for the period from 2000 to 2030 are approximately 40.1 percent for Lee County and 133.9 percent for Bastrop County, or 113.9 percent overall. Projections of estimated groundwater withdrawal are discussed in Section 3.2.3.3.

2.6.2.5 Future Population Growth

Growth projections for the three-county study area over the 25-year life of the Three Oaks Mine suggest a continuation of recent trends. The result would be a very substantial population increase in Bastrop County and more modest increases in Lee and Milam Counties. Bastrop County's population is expected to nearly triple by 2030 to a total of 154,987 people. The average annual growth rate is projected at 3.3 percent, which is notably lower than the 4.2 percent per year from 1990 to 2000, but still substantial. Lee County is projected to grow at 2.1 percent per year, virtually the same as the 2.0 percent rate since 1990. The resulting increase would be 13,862 people added to the 2000 census total of 15,657 for a total of 29,519. Milam County is projected to grow at a 1.2 percent average annual rate through 2030, increasing by 9,931 people to a total population of 34,169. The annual rate would be more than double the rate over the past decade; however, it still would be the lowest of the three counties (Texas Comptroller of Public Accounts 1998).

The difference in growth pressures among the three counties is likely related to the proximity and ease of access from Bastrop County to the rapidly growing Austin metropolitan area. Neither Lee nor Milam Counties is in a comparable location with the access afforded by U.S. Highway 290.

2.6.2.6 Transportation Projects Unrelated to the Proposed Three Oaks Mine Project

The TxDOT and Bastrop, Lee, and Williamson Counties have identified the following potential road construction projects in the vicinity of the proposed Three Oaks Mine during the anticipated schedule of project construction and operations.

- <u>U.S. Highway 290</u>
  Description – widen highway to 4-lane divided highway
  Location – from State Highway (SH) 95 to 1 mile east of FM 696
  Schedule – August 2003 to May 2005

- U.S. 290
  Description – widen highway to 4-lane divided highway
  Location – from 1 mile east of FM 696 to Giddings
  Schedule – estimated to begin in approximately 2009 (Note – this is a long-range planning project that has not yet been funded)

- CR 466 (Williamson County)
  Description – widen road ROW
  Location – from FM 619 to CR 463
  Schedule – estimated 2003

2.6.2.7 Proposed Regional Habitat Conservation Plan for the Houston Toad

The Bastrop County Stakeholder Workgroup is currently preparing a habitat conservation plan (HCP) to cover the potential incidental take of Houston toads on approximately 126,000 acres in Bastrop County; the HCP area is to the east of the proposed Three Oaks Mine permit area. The HCP will apply to the following actions in Bastrop County: residential and commercial construction, utility construction and maintenance, timber harvesting, land conversion from native to non-native sod (including clear cutting), ancillary home agriculture and public land activities (e.g., fence repair), fire suppression, prescribed burns, and understory clearing. The target date for implementation is December 2002.

2.6.2.8 Proposed Utilities Habitat Conservation Plan for the Houston Toad

Aqua Water Supply Corporation, Austin Energy, Bluebonnet Electric Cooperative, Inc., and the Lower Colorado River Authority (LCRA) are proposing an HCP to cover the incidental take of Houston toads during the installation of linear and fixed-foundation facilities and during the routine repair and maintenance of these facilities. The preliminary area to be addressed by the HCP includes areas of Bastrop and Lee Counties, to the east of the proposed Three Oaks Mine permit area. This HCP is in preparation, and 2002 is the target year for implementation.

2.7 Comparative Analysis of Alternatives

Table 2-16 summarizes and compares the projected environmental impacts of the Proposed Action and the No Action Alternative. Detailed descriptions of the impacts are presented in Chapter 3.0, Affected Environment and Environmental Consequences. The summarized impacts assume the absence of potential mitigation measures; implementation of the monitoring and mitigation measures identified in Chapter 3.0, and summarized in **Table 2-16**, would potentially reduce the impacts. Impacts are referred to as “short-term” through the life of the mine and reclamation or “long-term” if they persist beyond mine closure and reclamation.

Table 2-16
Impact Summary and Alternatives Comparison

Resource/Impact Issue	Proposed Action Impact	No Action Alternative Impact
Geology and Mineral Resources		
Modification of topography in the permit area.	Topography would be altered by the removal of overburden and lignite.	No modification of topography by mine construction or operation.
Removal of the lignite resource making it unavailable in the future.	Approximately 175 million tons of lignite would be extracted and utilized for power generation.	Lignite resources would not be removed.
Groundwater		
Groundwater level declines in aquifer outcrop areas.	Water levels in the Simsboro aquifer outcrop area west of the Three Oaks Mine would decline by 10 to 50 feet. Drawdown in the Calvert Bluff 200 and 800 lignite zones would not affect groundwater levels in the Calvert Bluff outcrop area.	Groundwater levels in the Simsboro aquifer outcrop area would continue to decline in response to municipal pumpage.
Groundwater level declines in private and municipal wells.	Water levels would decline for wells within the 20-foot or greater drawdown areas for the Simsboro aquifer and lower third of the Calvert Bluff aquifer. Alcoa would modify or replace impacted wells in accordance with RRC regulations	Groundwater levels in the Simsboro aquifer would continue to decline in response to municipal pumpage.
Surface Water		
Removal of surface water features.	Approximately 37 miles of ephemeral and intermittent stream channels would be removed. No adverse impacts following implementation of the aquatic resources mitigation program, the reclamation plan, and by developing riparian corridors in the fish and wildlife plan.	No removal of surface water features by mine construction or operation.
Flow effects of watershed modifications.	Peak flows would be attenuated and runoff durations increased. Following reclamation, approximately 15.3 square miles would be controlled by end lakes primarily during average and low runoff events. Reductions in average annual flows would be most noticeable on short reaches of ephemeral streams near the mine.	No watershed modifications by mine construction or operation.
Flow effects from groundwater discharges to streams.	Flow augmentation from groundwater discharges would occur during mine operations.	No modification of stream flow by mine construction or operation.
Flow effects on streams and springs from groundwater drawdown.	Groundwater contributions to spring and stream baseflows would decrease. This temporarily would be offset during the period of water discharge.	Groundwater contributions to spring and stream baseflow would decline in response to municipal pumpage.

Table 2-16 (Continued)

Resource/Impact Issue	Proposed Action Impact	No Action Alternative Impact
Water quality.	No adverse impacts following implementation of surface water management plan and TPDES permit provisions.	No effects on water quality from mine construction or operation.
Erosion and sedimentation.	No adverse impacts following implementation of reclamation plan, surface water management plan, and TPDES permit provisions.	No surface disturbance from mine construction or operation.
Surface water rights and beneficial uses.	No adverse impacts to limited rights and by compliance with alternative water supply mitigation requirements in 16 TAC Part 1, Chapter 12, Subchapter G, Division 5, Rule 12.130, as necessary.	No effects on water uses from mine construction or operation.
Loss of waters of the U.S., including wetlands.	A total of 67.4 acres of jurisdictional waters of the U.S. temporarily would be impacted as a result of mine construction and operation. This includes 5.3 acres of wetlands, 23.6 acres of jurisdictional streams (ephemeral and intermittent), and 38.5 acres of on-channel ponds. Alcoa's mitigation and enhancement program would result in a net increase of approximately 34.9 acres of waters of the U.S. Additionally, 73.5 acres of waters of the U.S. may be affected within the Simsboro outcrop where aquifer depressurization may affect surface water availability.	No change in wetlands or waters of the U.S. caused by mine construction or operation.
Soils		
Accelerated erosion in disturbed areas.	Impacts to soils would be minimized with the implementation of erosion control measures.	Existing soils would not be disturbed or removed by mine construction or operation.
Vegetation		
Impact to native Post Oak Savannah vegetation.	Long-term loss of woody species and short-term loss of herbaceous vegetation.	Vegetation would not be affected by mine construction or operation.
Impacts to wetland and riparian vegetation.	See wetlands and waters of the U.S. for impacts to wetlands. Riparian vegetation associated with springs or seeps in the Simsboro outcrop area and along the Big Sandy and Middle Yegua Creeks would be affected by changes in water levels and surface flows.	Wetlands and riparian areas would not be affected by mine construction or operations.

Table 2-16 (Continued)

Resource/Impact Issue	Proposed Action Impact	No Action Alternative Impact
Establishment of invasive plant species.	Potential increase in invasive plant species establishment in disturbed areas.	Vegetation currently present within the permit area would remain intact and would minimize the potential establishment of invasive plant species.
Impacts to loblolly pines of the Lost Pines Region from drawdown.	No impact; water level changes would not affect loblolly pine stands.	No impact to loblolly pines as a result of mine construction or operation.
Impacts to economically harvestable vegetation.	Long-term loss of trees used for commercial uses (i.e., firewood) would occur.	Native vegetation would not be removed by mine construction or operation.
Impacts to special status plants species.	No impact to special status plant species or potential habitat.	No impact to special status plant species or potential habitat from mine construction or operation.
Fish and Wildlife		
Loss of aquatic habitat from mining.	Approximately 37 miles of stream channels (jurisdictional and non-jurisdictional) and 69.9 acres of ponds (on-channel and isolated) would be incrementally removed during the life of the mine resulting in a temporary loss of aquatic habitat. Following reclamation, there would be a net increase of 825 acres pond habitat, and some stream reaches would be replaced.	No loss of stream and pond habitat would result from mine construction or operation.
Habitat reduction due to reduced runoff and water level changes.	Reduced runoff and water level changes would result in habitat reductions in Big Sandy, Middle Yegua, and East Yegua Creeks.	No runoff reduction would occur from mine construction or operation. Water level changes would decline in response to municipal pumpage.
Habitat increases due to mine water discharges.	Flow increases in Big Sandy and Middle Yegua Creeks would result in increased habitat for aquatic communities during the life of the mine.	No increased habitat would result from mine reclamation.
Direct habitat loss or alteration.	Short-term impact resulting from direct disturbance of 8,654 acres, most of which currently provides wildlife habitat.	No habitat loss from mine construction or operation.
Disturbance to nesting raptors and other migratory birds.	Possible loss of raptors and other migratory birds by ground clearing during the nesting season.	No disturbance to nesting birds from mine construction and operation.
Utility line impacts on raptors and other migratory birds.	Potential collision of raptors and waterfowl species. Potential electrocution of raptors using power poles.	No impacts from utility lines beyond current conditions.
Impacts to special status wildlife species.	Potentially suitable habitat for the timber/canebrake rattlesnake, Texas horned lizard, and loggerhead shrike may be affected by mine construction and operation.	Potential habitat would not be disturbed by mine construction or operation.

Table 2-16 (Continued)

Resource/Impact Issue	Proposed Action Impact	No Action Alternative Impact
Paleontological Resources		
Disturbance to unique or significant paleontological resources.	No impacts expected to unique or significant invertebrate, vertebrate, or paleobotanical fossils.	No impacts to fossils from mine construction or operation.
Cultural Resources		
Direct impacts to cultural resources.	Direct disturbance to 134 known cultural sites, including 4 National Register of Historic Places (NRHP)-eligible sites. Impacts to NRHP-eligible sites would be minimized by implementation of site protection or treatment plans. Texas Historical Commission (THC) and USACE determination is pending on a few of the remaining sites that are undergoing additional evaluation or testing. Surveys and Section 106 consultation are pending for 150 acres within the mine area.	No impacts to cultural resources from mine construction or operation.
Potential impacts to previously undiscovered significant sites.	Previously unidentified sites could be discovered during construction or operation.	No impacts to undiscovered sites from mine construction or operation.
Potential indirect impacts to cultural resources.	Indirect effects could occur from increased human activity. Visual impact would occur for 1 NRHP-eligible site. This impact would be minimized by implementation of site protection or treatment plans.	No indirect impacts from mine-related human activities.
Air Quality		
Potential exceedence of ambient air quality standards.	Concentrations of particulate matter less than 10 microns in diameter (PM_{10}) and total suspended particulates (TSP) could exceed federal and state standards.	Reduction in PM_{10} emissions upon Sandow Mine closure.
Land Use and Recreation		
Compliance with local plans and policies.	No applicable plans or policies.	No applicable plans or policies.
Potential destruction of Post Oak Savanna and farmland.	Long-term loss of woody species of the Post Oak Savanna. Following reclamation, productive agricultural uses would be restored.	No impacts to land uses from mine construction or operation.
Loss of agricultural productivity (agricultural wells) due to lowered water table.	Wells may be affected by groundwater pumping. Alcoa would modify or replace impacted wells in accordance with RRC regulations.	No groundwater pumping related to mine activities.

Table 2-16 (Continued)

Resource/Impact Issue	Proposed Action Impact	No Action Alternative Impact
Loss of agricultural productivity (flow reductions in springs and stream baseflows) due to lowered water table.	Spring and stream baseflows would decrease as a result of groundwater pumping.	Spring and stream baseflows would decline in response to municipal pumpage.
Change in recreation demand or available supply.	Minimal effects on recreation resources.	Reduced recreation demand due to job-related population decline.
Loss of wildlife viewing and hunting opportunities due to habitat loss.	Minor, short-term habitat loss; long-term increase in wildlife habitat following reclamation.	No impact on wildlife habitat due to mine construction or operation.
Impacts on state parks.	No impacts to recreational resources at state parks.	No impact on state parks.
Social and Economic Values		
Population change.	No impact on area population.	Population decline expected due to substantial loss of jobs.
Employment and income change.	Temporary 1-year increase of 150 contract construction workers with related income increase.	Loss of 210 jobs due to closure of the Sandow Mine and 1,400 jobs due to closure of the aluminum smelter, plus a loss of an estimated 1,666 indirect and induced jobs.
Changes to local public finance.	Increased tax revenues for Lee and Bastrop Counties.	Decreased tax revenues for Milam County; no change for Lee and Bastrop Counties.
Change in demand for public services.	Minimal change to service demands due to minimal movement of workers.	Reduced demand for services in Milam County.
Impact on schools.	No impact on schools.	Reduced school-age population in Milam County with commensurate loss of school funding.
Decline in property values.	Short-term residential values decline in close proximity to active mining due to noise and visual impacts; minor long-term increase in values due to permanent open space.	Potential decline in Milam County values due to decreased population with related reduction in demand for property.
Reduced growth potential for Lee and Bastrop Counties.	Short-term loss in close proximity to active mining; no effect elsewhere.	No mine-related effects.
Loss of quality of life.	Short-term increases in noise, visual effects, and night lighting in close proximity to active mining.	No effect in Three Oaks Mine area; increased unemployment and attendant problems in Milam County and surroundings.

Table 2-16 (Continued)

Resource/Impact Issue	Proposed Action Impact	No Action Alternative Impact
Transportation		
Change in travel distance/time due to roadway relocations and modifications.	Travel distances would increase and decrease by a maximum of 1.1 miles, equal to 1 minute and 19 seconds at 50 mph or 2 minutes and 12 seconds at 30 mph.	No mine-related impacts on area travel.
Compliance with Level of Service (LOS) standards.	Minor reduction in LOS on FM 696; would still meet standards.	No change in LOS.
Heavy truck traffic.	Minor increase on public roads; lignite hauling on separate, private ROW.	No mine-related increase in truck traffic.
Highway safety.	Project-related traffic increase would increase accident risk slightly; proposed roadway improvements would reduce risk.	No mine-related improvements to area roadways.
Noise and Visual Resources		
Loss of rural landscape character and vegetation diversity.	Existing landscape character would be lost from the time of initial clearing until reclamation has been successfully completed.	No mine-related change in rural landscape character or vegetation diversity.
Light and glare interference with views of the night sky.	24-hour operations would introduce light and glare in the night sky. Lights would be shielded and aimed downward to minimize light spillage off the mine site.	No mine-related change in views of night sky.
Dust emissions affecting local visual quality.	Dust emissions would be minimal due to on-going dust control activity.	No dust emissions related to mining activities.
Annoyance noise levels at sensitive receptors.	Noise levels would be notably higher than ambient levels at times; would exceed USEPA threshold of 10 decibels (dBA) over background levels; would exceed U.S. Department of Housing and Urban Development (HUD) day-night average noise levels (L_{dn}) standard of 65 dBA at some receptors.	No annoyance noise related to mining activities.
Hazardous Materials		
Generation of hazardous wastes.	Hazardous wastes would be generated during mine construction and operation. Hazard wastes would be disposed of in accordance with current regulations.	No hazardous wastes would be generated by mining activities.
Spill of hazardous materials during transportation.	There would be a 5 percent chance of an accident resulting in a spill of hazardous materials during the 25-year life of the mine. Hazardous material transporters are required to have spill response plans that can be implemented in the event of an accident and spill.	Mine-related hazardous material transportation would not be necessary.

Table 2-16 (Continued)

Resource/Impact Issue	Proposed Action Impact	No Action Alternative Impact
Spill of hazardous materials during storage and operation.	Hazardous materials could be spilled during storage and use at the mine site. This potential would be minimized by storage in appropriate containment and implementation of the spill response plan in the event of a spill.	No mine-related hazardous materials would be stored or used.
Public Health		
Impacts to health of local population.	No adverse health impacts are anticipated due to water quality, air quality, noise, or night-lighting.	Reduction in fugitive dust and point source emissions associated with Sandow Mine and smelter closures, respectively.
Environmental Justice		
Low income or minority population disproportionately affected.	No disproportionality identified.	No disproportionality identified.